

# ***The Rocky Flats Long-Term Stewardship Strategy***

***Final Draft  
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***Prepared by the U.S. Department of Energy  
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# The Rocky Flats Long-Term Stewardship Strategy

## Executive Summary

The U.S Department of Energy, Rocky Flats Project Office (DOE, RFPO) and its contractors are currently cleaning up and closing Rocky Flats, with oversight and input from regulators and stakeholders. While the cleanup has not been completed, the remedial actions that have been completed, or which are now planned, will likely result in not all contamination being removed. Activities related to the long-term management of this contamination form the basis for long-term stewardship at Rocky Flats, and are the subject of *The Rocky Flats Long-Term Stewardship Strategy*. The *Strategy* takes into account guidance received from DOE Headquarters, but has been drafted to reflect specific conditions and concerns at Rocky Flats. The *Strategy* is intended to inform decisions related to cleanup and closure of Rocky Flats, but is not itself a decision document pursuant to the Rocky Flats Cleanup Agreement.

The *Strategy* is divided into two parts. The first part discusses long-term stewardship definitions, Site background and history, end state issues and their effects on potential long-term stewardship liabilities, and RFPO policies on important long-term stewardship issues. The second part of the *Strategy* contains planning considerations for individual long-term stewardship topics, both related to and independent of the remedy, such as use of institutional and engineered controls, environmental monitoring and periodic review, information management, contingency planning and emergency response, public participation and natural resources management. The *Strategy* does not address non-environmental issues that may become post-closure activities for DOE, such as contract closeout or retiree benefits administration.

As stated in Part One of the *Strategy*, RFPO believes that long-term Site stewardship is a federal responsibility that will continue at Rocky Flats after the period of active remediation. The *Strategy* proposes the following general approaches to long-term stewardship:

- 1) conduct a thorough, risk-based cleanup based upon protective cleanup levels, factoring long-term stewardship into remedy decisions;
- 2) select appropriate engineering controls and institutional controls to minimize risks posed by residual contamination;
- 3) monitor the continued performance of the remedy as appropriate;
- 4) maintain information that will allow future users to make informed decisions about Site management; and,
- 5) perform regular reviews of the protectiveness of the cleanup, as well as advances in remedial technology.

The need for and extent of long-term stewardship activities at Rocky Flats will be analyzed in the regulatory documents leading to Site closure, such as the Resource

Conservation and Recovery Act (RCRA) Facility Investigation-Remedial Investigation/Corrective measures Study-Feasibility Study. Appropriate requirements for long-term stewardship activities will be described as part of the preferred alternative in the Proposed Plan. RFPO recognizes the need to integrate multiple types of stewardship activities to ensure that remedies remain effective. DOE will submit requests for appropriate funding related to post-closure activities.

The Chapters in Part Two of the *Strategy* focus on individual long-term stewardship issues, as follows:

- Chapter One, Regulatory Authorities for Long-Term Stewardship Activities, states that the Rocky Flats Cleanup Agreement (RFCA) Parties anticipate that enforceable post-closure requirements will exist to ensure the protectiveness of the remedy in accordance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) remedy selection process and the corrective action and closure process in RCRA/Colorado Hazardous Waste Act (CHWA). The need for, and extent of, long-term stewardship activities will be analyzed in the RCRA Facility Investigation-Remedial Investigation/Corrective Measures Study-Feasibility Study. Appropriate requirements for long-term stewardship activities will be described as part of the preferred alternative in the Proposed Plan. Examples of such stewardship activities include: monitoring, maintenance, information management and remedy review. Appropriate requirements will be contained in all final Site Corrective Action Decisions/Record of Decisions (CAD/RODs), and in any modified RFCA consistent with RFCA Paragraph 286.
- Chapter Two, Institutional and Physical Controls, discusses the potential types and extents of institutional and physical controls at Rocky Flats (although selection of such controls will be made as part of the final remedy). Institutional controls will be part of the final remedy as appropriate to ensure the protection of human health and the environment. They may be used in the following areas: areas of known or possible subsurface soil contamination, areas of groundwater contamination, certain areas of surface soil contamination, and areas with engineered controls. Circumstances where physical controls may be used include protection of engineered controls, ensuring that monitoring systems are secure, delineation of property whose administrative jurisdiction is retained by DOE, and the use of security patrols. While not directly related to the Rocky Flats remedy, establishment of a wildlife refuge over most of the Site, as required by the Rocky Flats National Wildlife Refuge Act, could strengthen remedy-related institutional controls.
- Chapter Three, Engineered Controls, discusses the types and locations of engineered controls that may be in place at Rocky Flats following closure. While no final remedy has been selected for Rocky Flats, three types of engineered controls are likely to remain after remediation is complete: groundwater barriers and passive treatment systems, one or more landfill covers, and water management structures such as ponds and ditches. Each type of engineered control has long-term stewardship activities associated

with it, including institutional and physical controls, maintenance and monitoring.

- Chapter Four, Environmental Monitoring and Periodic Review, discusses current and potential long-term monitoring regimes for surface water, groundwater, air and ecology. Some or all of these monitoring programs may be scaled back following closure, and RFPO will work closely with its regulators and the community to determine the monitoring that will be needed after closure. RFPO recognizes the community's desire to conduct periodic reviews of the remedy on a more frequent basis than the five-year interval prescribed in the Comprehensive Environmental Response, Compensation and Liability Act, and will consult with the community on this topic.
- Chapter Five, Records and Information Management, discusses the types of information that will need to be managed by DOE following the closure of Rocky Flats. This information may include information relating to Site activities, information on remedial activities, and historic and ongoing environmental data. Accessibility of this information to future DOE managers, regulators and the public will be a major issue.
- Chapter Six, Uncertainty Management, Contingency Planning, and Emergency Response, examines the potential sources of uncertainty that could lead to changes in long-term stewardship activities, and some of the major assumptions underlying the policies and plans set forth in the *Strategy*. Potential sources of uncertainty include regulatory changes, unforeseen physical changes, compromised institutional or physical controls, discovery of additional contamination, or innovative new technologies. A number of techniques could be used for contingency planning that could reduce the effects of potential uncertainties. RFPO believes situations after closure that could pose an immediate hazard associated with the prior use of Rocky Flats are highly unlikely. Two of these potential situations could be a wildfire or the catastrophic failure of a terminal pond dam. Both could require emergency response, and the establishment of emergency contacts and responsibilities.
- Chapter Seven, Funding and Human Resources Needs, explores the funding requirements for long-term stewardship activities. RFPO estimates, preliminarily, that yearly long-term stewardship costs at Rocky Flats could be about \$12 million, in present-day dollars. This estimate includes such things as maintaining institutional and engineered controls, environmental monitoring, records and information management, realty and litigation costs, overhead and contingency. The estimate also includes funding for a small, local DOE office to oversee long-term stewardship activities at Rocky Flats, although no decision on whether such an office will remain has yet been made by DOE.
- Chapter Eight, Public Involvement, describes RFPO's plans regarding public involvement for the formulation and implementation of the Rocky Flats long-term stewardship program. While public involvement activities at Rocky Flats will likely drop precipitously following closure, a number of items could be part of a post-closure public involvement program, such as: regular data

dissemination, regular information updates, local DOE staffing, establishing emergency contacts, and setting up a local information repository. RFPO believes that these activities could be formalized as a post-closure public information plan.

- Chapter Nine, Natural Resources, Cultural Resources, and Historic Preservation, describes the Site's natural resources and the management of them. Vegetation and wildlife are diverse and abundant, while cultural resources are scarce. RFPO anticipates that management of these resources will be transferred to the U.S. Fish and Wildlife Service, which will manage them under the auspices of a Comprehensive Conservation Plan for the wildlife refuge, which is currently in preparation.

Appendix 1 is a table summarizing the long term stewardship activities associated with completed remedial actions at Rocky Flats. RFPO intends to update this section of the *Strategy* as remedial actions are completed, as a quick reference of Site conditions.

RFPO also intends to update the *Strategy* more generally on a regular basis, to incorporate policy and regulatory changes, and to reflect ongoing remedy completion.



# **The Rocky Flats Long-Term Stewardship Strategy**

## **Part One: General Principles and Policies**

### **Chapter One**

#### ***Introduction, Purpose and Scope***

##### **Introduction**

The Rocky Flats Environmental Technology Site (Site) has had a long, prominent history that has spanned more than fifty years. That history is quickly drawing to a close. By the end of 2006, assuming all goes as planned, the Rocky Flats production buildings, parking lots, offices and infrastructure will be no more, replaced by prairie, with little left to mark what was once there. The country's use for the land will have changed, from weapons production to wildlife refuge.

The Department of Energy, Rocky Flats Project Office (DOE, RFPO) and its contractors, State and Federal regulators, and members of the Rocky Flats community are currently engaged in the cleanup and closure of Rocky Flats. While final cleanup has not yet been completed, RFPO expects that, after closure, some contamination, an unintended consequence of years of weapons production, will remain at the Site. Some contaminated areas may need special controls for many years, and appropriate monitoring will be required to ensure that the remedies put in place as Rocky Flats is closed remain protective. Just as importantly, information about Site conditions will be maintained, in accordance with applicable laws, to inform future generations of any remaining risks at Rocky Flats, and to allow them to make informed choices about the use of the Site. These activities make up long-term stewardship at Rocky Flats, and they are the subject of this document.

*The Rocky Flats Long-Term Stewardship Strategy* is being drafted in accordance with the direction of the DOE, Office of Environmental Management. It takes into account guidance received from DOE Headquarters, but it has been drafted to reflect the conditions and concerns specific to Rocky Flats. This document is itself a policy document containing pertinent information related to the eventual long-term stewardship of Rocky Flats. It is intended to inform decisions related to the cleanup and closure of Rocky Flats, but it is not itself a decision document.

##### **Purpose**

Assuming that some contamination will remain after the closure of Rocky Flats that may pose risks to human health and the environment, there will be a need for appropriate long-term stewardship activities. *The Rocky Flats Long-term Stewardship Strategy*

proposes DOE policies and planning considerations for long-term stewardship. The *Strategy* serves several purposes:

- To discuss end state issues at Rocky Flats and their potential impacts on DOE's long-term stewardship activities;
- To establish long-term stewardship policies to consistently guide closure and post-closure activities;
- To begin to formulate specific plans for individual long-term stewardship concerns, such as environmental monitoring and information management;
- To develop a mechanism (such as in Site remedial action decision documents) for incorporation of long-term stewardship considerations into Rocky Flats Cleanup Agreement (RFCA) decision documents;
- To refine cost estimates and produce a baseline for potential stewardship activities; and,
- To establish a process for community involvement for long-term stewardship at Rocky Flats to extend beyond the closure of the Site, now scheduled for 2006.

Overall, the *Strategy* creates a set of common expectations for long-term stewardship, between DOE and its stakeholders (that is, regulators, Congresspersons, local governments, oversight and public interest groups, and the general public), to help provide accountability for DOE's actions through and beyond the closure of Rocky Flats.

The *Strategy* is not intended to be a stand-alone document. Rather, it addresses long-term stewardship issues in the context of existing environmental laws (most notably the Comprehensive Environmental Restoration, Compensation and Liability Act [CERCLA], the Resource Conservation and Recovery Act [RCRA], and the Colorado Hazardous Waste Act [CHWA]), and existing regulatory agreements such as RFCA. The *Strategy* also draws upon DOE Headquarters guidance in formulating long-term stewardship plans and policies, as well as significant documents that have been produced by other Federal agencies, oversight groups and community organizations. The *Strategy*, of necessity, will be subject to ongoing review and revision, and is planned to be used in part as an informal record of the long-term stewardship implications of accelerated cleanup actions at Rocky Flats. The *Strategy* will not, however, supplant the Site's Administrative Record.

### Organization and Scope

The *Strategy* is divided into two parts. The first part discusses long-term stewardship definitions and important guidance, end state issues and their effects on potential long-term stewardship liabilities, and establishes overall DOE Rocky Flats Field Office (RFPO) policies on important long-term stewardship issues. Once established, RFPO anticipates that these policies will remain constant, to establish consistency in the approach to long-term stewardship at Rocky Flats. The second part of the *Strategy* contains Site-specific planning considerations for a number of individual long-term stewardship topics, including use of institutional and engineered controls, monitoring and periodic review, information management, public participation and natural resources

management. RFPO recognizes that this portion of the Strategy will evolve over time, as the individual remedies that affect long-term stewardship are selected and implemented. The *Strategy* also contains a listing of completed accelerated actions, along with their long-term stewardship implications; this is found as Appendix 1.

This document addresses long-term stewardship activities and issues that arise from the residual contamination that will likely be left behind after the final remedy is complete. Many of these activities originate from requirements that may be imposed pursuant to CERCLA, RCRA, CHWA and RFCA. The *Strategy* does not address RFPO's policies and plans for other issues that may manifest themselves as potential long-term DOE obligations, such as retiree benefits. The *Strategy* assumes that administrative jurisdiction over and management of most of Rocky Flats will transfer to the U.S. Fish and Wildlife Service, for management as a national wildlife refuge.

RFPO recognizes the concern expressed by its stakeholders that stewardship plans be placed, as appropriate, in enforceable regulatory documents. However, the *Strategy* itself is a policy document. The Strategy does describe the components of long term stewardship activities at Rocky Flats that could ultimately be contained in decision documents or regulatory agreements. RFPO has received substantial public input on this *Strategy*, and will not make substantive changes to the Strategy without first seeking input from the regulators and from its stakeholders.

## Chapter Two

### ***Definitions of Stewardship Activities***

#### General Definition of Stewardship

Long-term stewardship is defined in the *National Study on Long-Term Stewardship* (further referred to as the *Study*) as “the physical controls, institutions, information and other mechanisms needed to ensure protection of people and the environment at sites where DOE has completed or plans to complete ‘cleanup’ (e.g. landfill closures, remedial actions, removal actions, and facility stabilization). This concept of long-term stewardship includes, *inter alia*, land-use controls, monitoring, maintenance, and information management.”

A site conducts long-term stewardship once required remediation, disposal, or stabilization activities are complete. In the case of long-term remedial actions, long-term stewardship commences when the remedy is shown to be functioning properly and operating as designed. Large, complex sites like Rocky Flats may remediate portions of the site while other parts are still performing mission-related work. Thus, specific actions that would normally be associated with long-term stewardship (such as monitoring the effectiveness of engineered controls) may start years before site closure. Planning for long-term stewardship should begin in the remedy selection process.

### Institutional and Physical Controls

Institutional and physical controls are measures that limit activities and/or access to land, groundwater, surface water, and waste disposal areas in order to prevent or reduce exposure to hazardous substances. These kinds of controls may be used in conjunction with other stewardship measures such as engineered controls, and may be necessary to ensure that a remedy remains protective of human health and the environment. In general, institutional and physical controls are not intended to reduce the quantity, toxicity or mobility of hazardous substances in the environment. These controls may be temporary restrictions or permanent requirements.

Institutional controls are administrative or legal in nature, and are generally implemented or enforced by a government entity (including DOE; as examples, deed restrictions are generally recorded with the county, and zoning ordinances are passed and enforced by municipalities). They can include restrictions on land and water use, land use legislation, covenants, excavation permit requirements, etc. Institutional controls can include deed notifications and restrictions, title transfers and easements. Physical controls include guards, signs and fences that deter access to contaminated areas, or which preclude specific uses (e.g., “No Fishing”). For both types of controls, long-term monitoring may be needed. Monitoring of institutional controls ensures that these controls remain effective. Similarly, physical controls require periodic inspection, and also need maintenance in the form of replacing signs and mending fences.

The selection of institutional and physical controls depends upon the stage of remediation (i.e. before, during, or after cleanup), the risks posed by the hazards that are present, and the use of engineered controls. According to the *Study*, the evaluation of each remedial alternative should include the identification, description, and assessment of systems for implementing, enforcing, and funding institutional and physical controls within the site-specific context of affected parties. While the selection of individual institutional controls is dependent upon the final remedy selected, and therefore cannot be known at this time, the following institutional controls will be used as appropriate to protect human health and the environment:

- prohibitions of construction and use of buildings in contaminated areas;
- prohibitions on drilling wells for water use in contaminated groundwater, the use of contaminated groundwater and/or pumping groundwater that could adversely affect the remedy;
- restrictions on excavation in areas above subsurface contamination or intrusion into subsurface contamination;
- restrictions on activities that cause soil disturbance in areas with surface soil contamination; and,
- other restrictions to protect engineered controls (such as covers, groundwater barriers, and treatment cells) and monitoring systems.

Appropriate requirements for institutional controls at Rocky Flats will be contained in instruments such as final CAD/RODs, and in any modified RFCA Agreement consistent with RFCA Paragraph 286.

### Engineered Controls

Engineered controls are defined in the *Study* to include “actions implemented to stabilize and/or physically contain or isolate waste, contamination, or other residual hazards, such as in-situ stabilization, caps on residual contamination, and vaults, repositories, or engineered landfills designed to isolate waste or materials.” Engineered controls include physical systems such as caps and covers, groundwater barriers, ponds, and ditches.

Engineered control systems have finite design lives; thus, periodic monitoring of engineered controls is necessary to alert site managers to breakdowns of controls and hazardous substance releases. Maintenance of engineered controls includes routine repairs and replacement; these can be documented in operation and maintenance plans for individual engineered controls or for the site as a whole.

### Monitoring and Maintenance

The final remedy may require that environmental monitoring remain in place to ensure that the final remedy remains protective of human health and the environment. Assuming they are used after closure, both engineered and institutional controls need inspection and periodic maintenance to ensure continued performance, since they have finite lives. RFPO intends to incorporate project-specific monitoring and maintenance recommendation into either individual decision documents or, more likely, in project closeout reports. Monitoring and maintenance regimes may be specified in documents like CAD/RODs, or RFCA accelerated action decision documents. The effectiveness of monitoring and maintenance activities can be a major part of regular remedy reviews, such as the five year reviews required at many Superfund sites, or inspections under RCRA/CHWA.

### Information Management

As DOE sites make the transition from cleanup to stewardship, site stewards and surrounding stakeholders and will need detailed, accurate information about the location and nature of residual hazards and the processes and cleanup strategies that generated these hazards. The *Study* identified general considerations for information management: uniform criteria, high data quality, accurate information, public trust in the information, and the ability of future generations to read and readily access the information, remotely and/or at a centralized repository.

Management of some long-term stewardship information is governed by external regulation, such as section 113(k) of CERCLA requiring the establishment of an administrative record file containing all information and documentation used in the selection of a response action. The National Archives and Records Administration (NARA) retains the records either permanently or for varying periods of time (i.e. 75-80 years). At Rocky Flats, the RFCA agreement among DOE, the U.S. Environmental Protection Agency (EPA), and the Colorado Department of Public Health and the Environment (CDPHE) has required the site to establish mechanisms to exchange information, to integrate natural resource monitoring, and speaks to maintaining the Administrative Record and information repositories. While these requirements have been

initially addressed, considerable additional work remains prior to closure to ensure that appropriate record are retained, and that these records remain accessible to the public.–

## Chapter Three

### ***Site Background and End State Considerations***

#### Site Setting and Characteristics

*General* - - Rocky Flats lies approximately eighteen miles northwest of downtown Denver, Colorado (Figures 1,2). It occupies about 6,400 acres (roughly ten square miles), of which about 400 acres is a developed Industrial Area (IA), containing about 404 permanent structures, with the remainder being a largely undeveloped Buffer Zone. The majority of the Site lies within Jefferson County, Colorado, while a small portion of the northern part of the Site lies within Boulder County, Colorado. Rocky Flats is generally surrounded by undeveloped open space (Figure 3). However, approximately 11,000 people live within four miles of the Site's boundaries.

Site elevation is about 6,000 feet. The climate is temperate and semi-arid, typical of Colorado's Front Range. Summer high temperatures are typically in the mid-80 degree Fahrenheit range, while wintertime highs are typically within the low 40-degree F range. Annual average precipitation is about 14.5 inches, with about half falling as rain and the remainder as snow. Precipitation is highest from April through June, with over forty per cent of the annual average precipitation falling during those months.

*Geology and Hydrology* - - Rocky Flats is situated about two miles east of the Front Range of Colorado, on the western margin of the Colorado Piedmont section of the Great Plains Physiographic Province. Nearly the entire Site is covered with unconsolidated surficial deposits, including Rocky Flats Alluvium along the tops of the pediments, including the IA; Valley Fill Alluvium along stream beds; colluvium along the margins of the creek floodplains; and artificial fill in some areas of the IA. These unconsolidated deposits transmit the vast majority of groundwater at the Site. Beneath the unconsolidated materials is bedrock from the Arapahoe Formation (composed primarily of claystones), which has a thickness of about 25 feet or less. This is underlain by the unweathered Laramie Formation, consisting of an upper, thick, claystone interval and a lower sandstone/claystone/coal interval. The Laramie Formation is 600 to 800 feet thick beneath the Site; its low permeability precludes the movement of shallow groundwater through the Laramie Formation into the regional Laramie-Fox Hills aquifer below. Because of the Site's geology and the dissected nature of its topography, shallow groundwater in the IA surfaces and leaves the Site via surface drainages.

Surface water at the Site travels generally from west to east, with three primary drainages traversing Rocky Flats. These are, from north to south: Rock Creek, which drains the undeveloped northwestern expanse of the Site; Walnut Creek, which drains the central part of the Site, including most of the IA; and Woman Creek, which drains the southern

portion of the IA and the southern part of the RFETS Buffer Zone. These creeks are small, and are ephemeral or intermittent in nature, gaining or losing flows in response to precipitation. All of the drainages contain permanent, man-made ponds, most of which were constructed during the Rocky Flats weapons production years. More specific information on these ponds and other water management features is found in Part Two, Chapter Three of the *Strategy*.

*Vegetation and Wildlife* - - The Site's topography and proximity to the mountains supports a unique, diverse array of plant communities. Much of the Site is undisturbed prairie, including mesic mixed grasslands in the eastern part of the Site (covering about 2,000 acres), and xeric tallgrass prairie on flat upland areas in the western part of the Site (covering about 1,800 acres). The xeric tallgrass community is a rare plant community along the Front Range. Also found at Rocky Flats are wetlands (including seep wetlands along valley cuts), upland riparian woodlands, and Great Plains riparian woodlands.

Wildlife at Rocky Flats is also diverse, with over 250 terrestrial vertebrates having been recorded at the Site. Nearly 200 species of birds have been found at Rocky Flats. The Site is home to the Preble's Meadow Jumping Mouse, classified as a Threatened Species under the Federal Endangered Species Act.

More information on vegetation and wildlife is found in Part Two, Chapter Nine of the *Strategy*.

### Site Background

*Mission and Operational History* - - For about forty years, the Rocky Flats Plant was a key component of the nation's nuclear weapons production program. Located about eighteen miles northwest of downtown Denver, the Plant was involved in the production of nuclear weapons parts from plutonium, uranium, beryllium and stainless steel. The Plant also performed a number of auxiliary functions, including: recovery and purification of waste radionuclides; production of nuclear weapons transports; and basic research into metallurgy, machining techniques, nondestructive testing, coatings, remote engineering, chemistry and physics.

The need for Rocky Flats was established in January 1950, when President Truman ordered the Atomic Energy Commission to begin work on the hydrogen bomb. The Dow Chemical Company was selected as the contractor to provide the plutonium components for the bomb, and in March 1951 the Rocky Flats Site was selected for the new plant. The site was selected for its climate, its proximity to a metropolitan area from which a large workforce could be drawn, and because the area was attractive enough to aid in the recruitment of employees. Construction began that year, and the first weapons components were shipped by mid-1953.

By the end of the 1950's, many of the buildings that now (or did) dominate the scenery at Rocky Flats were in operation, including 111, 444, 771, 776/77, 881 and 991. Building 707, which would become the main production building for plutonium parts, went into

service in 1970. Building 371, which housed plutonium reprocessing operations, started up in 1981. Building 460, which produced stainless steel weapons parts, went into service in 1984. The Plant quickly became a large, stable employer in the area. The numbers of employees working at Rocky Flats rose from 1,813 in 1959 to 5,243 in 1989. Rockwell International replaced Dow Chemical as the contractor in 1975.

Nuclear weapons production continued at Rocky Flats through the 1980's. In 1989, a series of events occurred that would interrupt and ultimately end production at the Plant. On June 6, 1989, Federal agents from the Federal Bureau of Investigation and the EPA executed a search warrant at the Plant, to investigate suspected violations of environmental laws. Later that year, DOE asked EG&G to replace Rockwell. Shortly after assuming control, EG&G issued a work stoppage to address safety concerns. That work stoppage evolved into an exhaustive effort to review and resume production operations, with substantial DOE oversight. However, when President George Bush, Sr. announced the cancellation of a submarine-based warhead program in January 1992, the need for production at Rocky Flats ended. The end of weapons manufacturing at Rocky Flats came in July 1994, when the last stainless steel parts were produced in Building 460.

In the mid-1990's the Rocky Flats mission changed from weapons production to Site cleanup and closure. Kaiser-Hill was named as the Site's Integrating and Management Contractor in April 1995. In July 1996, DOE, EPA and the State of Colorado signed the Rocky Flats Cleanup Agreement (RFCA). Among other things, RFCA's Preamble contains a number of objectives for Site cleanup (based in part upon the recommendations of the citizen-based Future Site Use Working Group) and an overall schedule (albeit non-enforceable) for the completion of Site cleanup within 20-25 years. DOE and Kaiser-Hill are now working to a closure project baseline that calls for project completion by December 2006.

*Environmental Incidents* - - Over the course of fifty years, accidents and disposal practices have led to a number of environmental incidents at Rocky Flats. Some of the more noteworthy are described below.

- Building fires occurred on a number of occasions at Rocky Flats; of these, two are most notable. On September 11, 1957, a fire occurred in a glovebox in B771 in a plutonium fabrication line. The fire and subsequent control efforts resulted in the spread of contamination within the building and breached the filter plenums. The fire caused about \$800,000 in damage. On May 11, 1969, a major fire occurred in gloveboxes in B776, started by the spontaneous ignition of plutonium, causing extensive building contamination and release of plutonium to the atmosphere. The fire caused \$26.5 million in damage; it took over two years to complete decontamination efforts in the building. No injuries occurred, but 33 employees were treated for contamination. The fire led to a number of follow-on actions including use of inert atmospheres in gloveboxes, upgrades to the retention pond system, and purchase (in 1974) of additional buffer zone property.



- Drum storage in the area known as the 903 Pad, located off the southeast corner of the Industrial Area, caused environmental contamination. The Plant stored drums containing radioactive waste on the Pad beginning at least in 1958, and possibly as early as 1955. The wastes contained various hazardous constituents, including beryllium, solvents and uranium, as well as waste oils containing plutonium. Leaking drums were discovered as early as 1959, when a rust inhibitor was added to the drum contents in an attempt to prevent further deterioration. The area was closed in April 1967 when a heavy rainstorm caused the release of more contamination from the drums. The drums were removed in 1968, by which time numerous drums were empty, their contents having leaked entirely. Plant personnel placed an asphalt pad over the area in November 1969. The 1996 RCRA Facility Investigation/Remedial Investigation for Operable Unit 3 (Offsite Areas) concluded that the 903 Pad is the major source for plutonium releases to the environment from Rocky Flats operations. The 903 Pad is the subject of a removal action that is underway in 2003.
- The Plant used various disposal trenches and waste dumps during its early years. Many of these old disposal sites, such as the Mound, Trenches T-1, T-3, T-4, etc., are located just to the northeast of the 903 Pad near the old Inner East Gate, in the Mound-East Trenches Area. The various disposal areas were used from about 1954 to 1968. Many of the wastes that ended up there originated from B444 or the 800 area buildings. Common contaminants included depleted uranium and solvents; uranium in drums excavated from Trench T-1 made it necessary to take precautions to prevent these drums from catching fire from spontaneous combustion. A number of these sites (the Mound Source Area and Trenches T-1, T-3 and T-4) were remediated in the late 1990's. The Plant's Original Landfill, used from 1952 to 1968, lies on the hillside south of B460, and extends down to near Woman Creek. The Original Landfill received various wastes, including contaminated incinerator ash. Uranium is believed to be among the contaminants in the Original Landfill.
- The Plant put wastewaters containing nitrates and radioactive contaminants (primarily uranium) in a series of solar evaporation ponds that were in use in various configurations since December 1953. The Solar Ponds were located in the northeast corner of the Industrial Area, and were lined with earth, clay, concrete, asphalt and other materials at one time or another. In 1961, results from monitoring wells showed high nitrate concentrations in groundwater around the ponds, and a french drain system to capture this groundwater was installed in the 1960's. This system was upgraded in 1981, to include a pump house to capture more of the contaminated water. The Solar Ponds are no longer in use, having been drained and the sludge removed from them in the 1980's and 1990's. The remedial actions at the Solar Ponds were completed late in 2002.
- Industrial accidents have caused environmental releases at Rocky Flats. Tritium escaped from the Plant in 1973; its source was tritium-contaminated parts that had been shipped to Rocky Flats. The tritium reached Great Western Reservoir, then the drinking water supply for the City of Broomfield.

Unlike plutonium, americium and uranium isotopes, tritium does not remain in the environment for long periods of time. In February 1989, overflow of chromic acid from a plating bath tank in B444 eventually reached the sewage treatment plant and the pond system before being contained. After this incident, DOE signed a Federal Facility Compliance Agreement with EPA pursuant to the Clean Water Act, which led ultimately to substantial improvements to the sewage treatment plant. These improvements were intended to minimize the possibility of an industrial release to downstream surface water from Rocky Flats.

Some of these incidents, such as the 1973 tritium release, have had transitory effects. Others, however, such as releases from the 903 Pad, necessitate large cleanup efforts, and will likely ultimately affect site end state and DOE's long-term stewardship activities. A map of Individual Hazardous Substance Sites at Rocky Flats is shown as Figure 4.

#### Environmental Conditions and End State Considerations

This section of the *Strategy* discusses the environmental conditions at Rocky Flats. The section is arranged by environmental medium, and includes air, surface and groundwater, and surface and subsurface soils. For each medium, environmental contamination concerns are summarized, along with the potential options now being considered by RFPO for dealing with these concerns. Of course, individual remedy selections will be made in individual decision documents using the principles of RFCA and the CERCLA remedy selection criteria. Finally, the *Strategy* summarizes the stewardship implications of these end state considerations. More specific planning considerations for use of institutional controls, engineered controls and monitoring systems, as they are currently known, are found in the second part of this *Strategy*.

*Air* - - Air quality has been monitored at Rocky Flats by DOE and CDPHE for many years and has been excellent. The Site has a number of individual facilities, such as the steam plant and building emergency generators that are sources of pollutants (primarily particulates, nitrogen oxides and carbon monoxide) and have State-issued air quality permits. These permits require RFPO to limit fuel use and file annual reports to the regulators to demonstrate compliance. RFPO expects that these permits and their associated reporting requirements will be canceled as the facilities regulated under these permits are removed. Therefore, RFPO anticipates that no long-term stewardship activities will stem from this current regulatory obligation.

Rocky Flats is also required to demonstrate compliance with the radionuclide National Emission Standards for Hazardous Air Pollutants (rad-NESHAPs). In accordance with an agreement made with the EPA and CDPHE, rad-NESHAPs compliance is demonstrated with a network of fourteen air monitors around the perimeter of Rocky Flats. These monitors collect particulate samples, which are analyzed for plutonium, americium and uranium. Under the rad-NESHAPs regulation, the Site's emissions of airborne radionuclides must not exceed levels that would give a 10 millirem effective dose equivalent annual radiation dose to the closest off-Site receptor.

Data from calendar year 2000 (the latest available) show that total radionuclide emissions from Rocky Flats were less than 1.5% of the allowable limit at the monitor with the highest radionuclide levels. The largest component of these emissions appeared to be naturally occurring uranium, and the highest emissions were noted at a monitor located upwind of Rocky Flats, in the vicinity of gravel mining operations. The results for 2000 are typical of those seen in previous years.

Given the typically excellent air quality at Rocky Flats, RFPO is planning no remedial actions aimed at air quality improvements, although project specific air monitoring is incorporated as appropriate into a number of remedial actions. Comprehensive Environmental Response, Compensation and Liability Act requirements may necessitate long-term air monitoring at Rocky Flats. However, the current monitoring network may be reduced substantially after closure, considering past results and considering that substantial amounts of surface contamination will be removed as part of Site cleanup. RFPO anticipates that the post-closure air monitoring network, if any, will be specified pursuant to the final CAD/ROD, or post-closure regulatory agreement. RFPO recognizes that air monitoring is an important community issue, and intends to work closely with regulators and surrounding communities regarding post-closure air monitoring.

*Surface Water* - - Surface water at Rocky Flats has received a great deal of attention over the years from Site personnel, regulators and stakeholders, largely because of the potential for surface water to transport environmental contaminants offsite. Two major drainages, Woman Creek and Walnut Creek, drain water from the Industrial Area and contaminated reaches of the Buffer Zone (Figure 5). The Site constructed a series of retention ponds in these drainages to help contain any potential release of contaminated water, and substantially upgraded its sewage treatment plant to further minimize the possibility of an industrial release to surface water. In the early 1990's DOE provided a grant to the City of Broomfield for a project known as Option B. This project replaced Great Western Reservoir (located in the Walnut Creek drainage) with a new water supply for the City of Broomfield, and constructed Woman Creek Reservoir to intercept flow from Rocky Flats before it reached Standley Lake, the drinking water supply for the cities of Westminster, Thornton and Northglenn.

Surface water protection is a focal point of RFCA. Under RFCA, the Site must demonstrate compliance with water quality standards for radionuclides at designated RFCA Points of Compliance (POC's). The POC's are located on Woman Creek, Walnut Creek and the Mower Diversion Ditch at the Site boundary, and downstream of Terminal Ponds A-4, B-5 and C-2. The Site also monitors radionuclide levels in surface water at a number of RFCA Points of Evaluation (POE's), located upstream of the pond system. The RFCA water quality standards for plutonium and americium are each 0.15 picoCuries per liter, and these standards were based on a  $10^{-6}$  excess cancer risk from consuming two liters of water per day for thirty years. Compliance with the RFCA standards is determined using rolling thirty-day average values that are adjusted for flow rates, although the modifications to RFCA Attachment 5 allow for a yearly average for the purpose of demonstrating compliance at the outfalls of the terminal ponds. The Site has demonstrated consistent compliance with these standards at POC's, but has noted

higher values at certain POE's, especially those draining the Industrial Area. RFPO expects that monitoring to demonstrate compliance with surface water quality standards at defined points will continue following closure.

There are two general environmental pathways by which surface water quality at Rocky Flats could be compromised. The first of these is through seepage of contaminated groundwater into surface water. This pathway is of importance for contaminants such as organic solvents and soluble species such as nitrates and uranium. This type of potential contamination is controlled through groundwater management and treatment, and is discussed in the next part of the *Strategy*.

The second major pathway by which contaminants can enter surface water at Rocky Flats is surface runoff from contaminated soils. This pathway is of most concern for plutonium and americium. These radionuclides are found dispersed in surface soils in the Industrial Area (where they can be washed into the Walnut Creek Drainage) and in a contaminant plume in surface soil downwind of the 903 Pad, located primarily in the Woman Creek drainage. Plutonium and americium are virtually insoluble in the environment at Rocky Flats. They bind tightly to clays and other particulate material. Their movement in the environment is caused primarily by mechanical processes, such as erosion of soils by water and wind.

Controlling movement of these contaminants can be accomplished in two ways. One is by removal of contaminated surface soils. RFPO is beginning to remove substantial quantities of contaminated soils in the vicinity of the 903 Pad, but erosion models performed by the Rocky Flats Actinide Migration Evaluation Panel indicate that a combination of measures will need to be implemented to control actinide migration to surface water. By example, runoff from the Industrial Area sometimes contains plutonium and americium levels that exceed RFCA water quality action levels as measured at POE's, but the soil contains only low concentrations of actinides (that is, levels that are less than the soil action levels contained in the recent revisions to RFCA Attachment 5), and will probably not be removed. The other means of controlling the movement of these contaminants is by restricting the erosion of the particles to which they attach. This can be done a number of ways: by covering contaminated soils with clean soil, by recontouring and revegetating contaminated areas, and by restricting runoff by constructing water management structures.

All of these techniques will probably be used during the closure of Rocky Flats. Soil cover and revegetation may be very successful in reducing migration of plutonium and americium from the Industrial Area. Revegetation will employ native soils and seed mixes to the extent practicable. The exact nature of the water management system that will be used following closure is not yet known, awaiting the results of a sitewide water balance study and a final land configuration design. However, water management after closure may include ponds or other retention structures in the major drainages (Walnut and Woman Creeks), as well as diversion structures similar to the South Interceptor Ditch now in use in the Woman Creek Drainage. All of these types of features have been

shown to work well in controlling the amounts of particulates in surface water, thereby effectively reducing the concentrations of waterborne plutonium and americium.

There are obvious long-term stewardship implications posed by the management of water at Rocky Flats after closure. Monitoring of some kind will likely be needed to ensure that water quality standards continue to be met, and that the water management systems are performing as planned. Dams and ditches require maintenance to ensure continued performance, and regular operations for detention and release of water may be needed, depending on the design of these structures. Finally, on-site water controls need to be coordinated with systems operated downstream (such as Woman Creek Reservoir).

*Groundwater* - - There is a shallow, unconfined groundwater aquifer beneath the Rocky Flats Industrial Area, located in the Rocky Flats Alluvium. This aquifer has been contaminated in several places by organic solvents (especially carbon tetrachloride and trichloroethylene), nitrates, and uranium (Figure 6). However, this aquifer does not contain much water, and it is isolated from the regional Laramie-Fox Hills aquifer by several hundred feet of impermeable claystones of the upper Laramie Formation. Shallow groundwater beneath the Industrial Area surfaces in the form of seeps and springs before leaving the Site. Recognizing these facts, RFCA established groundwater action levels for the purpose of preventing the contamination of surface water.

In some areas, such as the 903 Pad/Ryan's Pit plume, groundwater contamination may never reach surface water, because of distance and the limited lifetime of the contaminants. In this case, monitored natural attenuation may be used in lieu of treatment of contamination as a remedial approach. In another case, the Property Utilization and Disposal (PU&D) yard plume located northwest of the Industrial Area, microbial degradation of organic contaminants is being enhanced through injection of lactic acid into the shallow aquifer. Both of these techniques may provide reasonable alternatives to more highly engineered approaches to groundwater treatment.

Other groundwater contaminant plumes at Rocky Flats require continued treatment in order to protect surface water. Examples include the East Trenches, Mound, and Solar Ponds plumes. Since groundwater in all three plumes is shallow and underlain by impermeable bedrock, the Site has installed groundwater barriers that lead to passive, gravity-fed treatment units. The treatment units are filled with an appropriate medium (such as iron filings and/or sawdust) that treat or remove contaminants. The media in these treatment units need to be replaced periodically, but have a life expectancy of ten years or more. Groundwater barriers and passive treatment systems may find additional uses at Rocky Flats as the nature of the groundwater contamination beneath the Industrial Area becomes better characterized. RFPO does not anticipate the need for more resource-intensive groundwater treatment systems, such as pump-and-treat systems, at Rocky Flats.

The current groundwater management approach at Rocky Flats does have long-term stewardship ramifications. Monitoring is anticipated, to track the effectiveness of monitored natural attenuation as well as the performance of treatment systems. Groundwater monitoring will also be performed as appropriate to determine if contaminants are migrating from known disposal sites, such as the original landfill and the present landfill. Treatment units themselves need periodic maintenance, including replacing the treatment media. Finally, specific institutional controls will be used where appropriate to deter drilling into and use of the contaminated groundwater that will probably remain under the Rocky Flats Industrial Area, although it should be emphasized that the amount of groundwater is extremely limited in most areas. Institutional controls restricting groundwater use are specifically contemplated in Attachment 5 of RFCA, and are also discussed in the recent revisions to RFCA Attachment 5.

*Surface Soils* - - The remediation of contaminated surface soils, especially soils containing radionuclides, will comprise an important part of the Rocky Flats closure project. Per RFCA Attachment 5, the purposes of setting action levels for the remediation of surface soils are to protect persons using the land, to protect surface water quality from runoff, and to protect ecological resources.

The most prominent area of surface soil contamination at Rocky Flats extends to the east of the 903 Pad. This area is contaminated by plutonium and americium (Figures 7, 8). Concentrations of plutonium in surface soils can be as high as 100,000 pCi/g in the immediate vicinity of the 903 Pad. Surface soil contamination is quite extensive: recognizable plutonium contributions from Rocky Flats extend beyond the Site's eastern boundary, although in the areas off of Rocky Flats, the levels of contamination allow for unrestricted use. The Operable Unit 3 (Offsite Areas) Corrective Action Decision/Record of Decision (OU 3 CAD/ROD) concluded that no remedial action off of Rocky Flats was warranted. Therefore, long-term stewardship implications resulting from surface soil cleanup will likely be limited to Rocky Flats itself, although DOE did agree to conduct a limited five-year review of the OU 3 CAD/ROD. The initial five-year review for OU3 was completed in 2002.

The Radionuclide Soil Action Levels (RSALs) were modified in 2003 for Rocky Flats surface soils. The RSALs guide the cleanup of surface soils containing plutonium, americium and uranium. The RSALs were recalculated using several different exposure scenarios (such as a rural resident and a wildlife refuge worker) and risk levels (from  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$ ). The RSAL for plutonium now found in the revisions to RFCA Attachment 5 is 50 pCi/g, corresponding to less than a  $1 \times 10^{-5}$  excess cancer risk for a wildlife refuge worker. This could mean that soil remediation in the vicinity of the 903 Pad would extend to an area of about thirty acres. Soil removal, either through excavation or soil vacuum, is currently envisioned as the primary means of remediation.

The long-term stewardship implications of surface soil remediation at Rocky Flats will depend on the extent and type of remedial actions used, and also on the risk posed by remaining contaminated soils. One stewardship concern that would be posed by soil removal is ensuring that revegetation efforts are successful, both to minimize the

potential for runoff that could carry contamination, and to restore the land to a beneficial use. RFPO intends to work closely with the U.S. Fish and Wildlife Service and Kaiser-Hill to implement an appropriate Site revegetation program.

If the risk posed by soils that are left behind after remediation is so high as to preclude reasonably foreseeable future uses (including residential development), then some form of institutional control may be needed to preclude this use. The revisions to RFCA Attachment 5 discuss the institutional controls in areas of surface soil contamination, stating that restrictions on activities that cause soil disturbance in areas of soil contamination will be used as appropriate to protect human health and the environment.

*Subsurface Soils* - - Per RFCA Attachment 5, action levels for remediation of subsurface soils are set for three reasons: protection of a future land user, protection of surface water through groundwater contamination, and protection of ecological resources.

Contamination of subsurface soils has occurred at Rocky Flats in a number of places, primarily in and around the Industrial Area. Examples have included leaking underground storage tanks (such as a carbon tetrachloride tank near B776), drum disposal trenches (such as T-3 and T-4 in the so-called East Trenches Area), the Solar Ponds, and may include leaks from process waste lines (Figure 9). The Original Landfill is the most significant example of subsurface disposal outside the Industrial Area. Certain areas of subsurface soil contamination, such as the old Mound Site (a former drum disposal area) have caused local groundwater contamination (see Figure 6).

The extent to which subsurface soil will be remediated at Rocky Flats, especially in the Industrial Area, is likely to be related to two factors. The first of these is the depth of contamination, which relates to the amount of risk that contamination poses to a future land user. The second factor is whether subsurface contamination is significant enough to warrant remediation because of a threat to surface water quality via a groundwater pathway. The revisions to RFCA Attachment 5 discuss subsurface soil remediation in detail. For non-radionuclide contaminants, soil contamination below six inches would be remediated if a soil risk screen showed that the contamination posed greater than a  $1 \times 10^{-5}$  risk to a wildlife refuge worker, or to protect surface water. For plutonium and americium, subsurface soils 3-6 feet below the surface would be remediated or not depending on the magnitude and extent of contamination, although any soils exceeding 7 nCi/g at this depth would be remediated. Soils below six feet would be remediated if a soil risk screen indicated that they posed a risk of greater than  $1 \times 10^{-5}$  to a wildlife refuge worker, or to protect surface water.

Several potential remedial options exist for subsurface soil at Rocky Flats. Monitored natural attenuation may be used in cases where surface water is not likely to be affected. Removal of subsurface soils is a straightforward remedial technique that may be used for near-surface, accessible contamination. Capping or soil covers can be used to help immobilize subsurface contamination; soil covers are an option being seriously considered for several areas at the Site. Contaminated soil could be moved to an area (such as a building basement) where the contaminants do not pose a risk to the surface

environment. Finally, groundwater barriers and passive treatment systems may be selected to prevent subsurface soil contamination from reaching surface water.

Contaminated subsurface soils that may remain after Rocky Flats closure will pose long-term stewardship considerations, depending on the remedial option selected. Institutional controls restricting intrusion into contaminated soil will be used as appropriate to protect human health and the environment. Similar to surface soil removals, removal or capping of subsurface soils will cause the need for successful revegetation of areas that are disturbed during the remediation. If residual subsurface soil contamination poses a potential surface water concern, additional soil removal or continued monitoring and/or treatment of groundwater may be needed. Finally, engineered controls such as caps or covers may need maintenance on a long-term basis.

## Chapter Four

### ***Site Long-term Stewardship Policies***

The purpose of this chapter is to define Site policies regarding long-term stewardship. The chapter discusses RFPO's general policies on individual stewardship topics, such as institutional controls and information management, and begins with the Site's general policies on stewardship. These policies are intended to be consistent with RFPO's requirements under CERCLA and RCRA/CHWA, and national DOE and EPA policies (as well as input from other national and local organizations) have been considered in the development of these Site-specific policies. Once established in this stewardship strategy, the Site will use these policies to guide its decisions in areas such as the design of remedial actions and engineered controls, the adoption of specific institutional controls, negotiating long-term regulatory agreements, etc. Individual project decisions will take into account additional factors such as technical feasibility and cost-effectiveness. However, these long-term stewardship policies should help RFPO make consistent project decisions that support achieving a cleanup that is reliably protective over the long-term.

#### General Site Stewardship Policies

RFPO believes that long-term Site stewardship is a federal responsibility that will continue at Rocky Flats long after cleanup and closure. The *Strategy* proposes the following general approaches to long-term stewardship:

- 1) conduct a thorough, risk-based cleanup based upon protective cleanup levels, factoring long-term stewardship into remedy decisions;
- 2) select appropriate engineering controls and institutional controls to minimize risks posed by residual contamination;
- 3) monitor the continued performance of the remedy as appropriate;
- 4) maintain information that will allow future users to make informed decisions about Site management; and,



- 5) perform regular reviews of the protectiveness of the cleanup, as well as advances in remedial technology.

The need for, and extent of, long-term stewardship activities will be analyzed in the RCRA Facility Investigation-Remedial Investigation/Corrective Measures Study-Feasibility Study (RFI-RI/CMS-FS). Appropriate requirements for long-term stewardship activities will be described as part of the preferred alternative in the Proposed Plan. Examples of such stewardship activities include: monitoring, maintenance, information management and remedy review. Appropriate requirements will be contained in all final CAD/RODs and in any modified RFCA consistent with RFCA Paragraph 286. As of the date of this document, DOE and CDPHE have not reached agreement as to whether a post-closure CHWA permit (or, alternatively, an enforceable document as defined in 6 Code of Colorado Regulations [CCR] 1007-3, 100.10(d)) will be required for Rocky Flats and, if so, whether that permit (or enforceable document) will also contain appropriate requirements for institutional controls or other long-term stewardship activities.

It is DOE policy to use institutional controls as essential components of a defense-in-depth strategy that uses multiple, relatively independent layers of safety to protect human health and the environment. This strategy uses a graded approach to attain a level of protection appropriate to the risks involved.

RFPO recognizes the need for integration of multiple long-term stewardship activities in some cases in order to ensure that environmental remedies remain effective at Rocky Flats. As an example, groundwater barriers and passive treatment systems require institutional controls, to prevent inadvertent excavation and to prevent groundwater pumping that could alter flow regimes. Additionally, they require physical controls to prevent unwanted intrusions into the treatment cells, and environmental monitoring to ensure that the systems are functioning as designed. Finally, engineered controls require maintenance regimes and contingency plans in case of failure. When analyzing long-term stewardship requirements, RFPO will consider all the needs posed by the long-term activities being proposed.

Long-term stewardship activities require funding over the long term, and RFPO recognizes the community's concern regarding assuring funding for long-term stewardship. RFPO recognizes that sound remedial decision-making can minimize the need for long-term expenditures. RFPO will therefore analyze life cycle costs in its proposed remedial actions. Where cost-effective and technically feasible, RFPO will propose remedies that lower long-term costs. DOE will submit requests for appropriate funding related to post-closure activities. RFPO also intends to explore currently available financial mechanisms that may provide additional assurances that long-term stewardship funding needs can be met, such as funding of multi-year contracts for items such as environmental monitoring and maintenance of engineered controls.

RFPO recognizes the vital role that its stakeholders play in making long-term stewardship decisions. All decisions made by the Site that affect its long-term condition will be made in an open public process.

### Institutional and Physical Controls

RFPO will use institutional controls as appropriate as part of the overall remedy at Rocky Flats. In some areas, institutional controls may be necessary to protect human health and the environment, such as from residual contamination in groundwater under the former Industrial Area. In other areas, institutional controls could add to the protectiveness of remedial actions, further minimizing risks that have already been reduced to acceptable levels. An example of this would be restrictions on building structures in slightly contaminated areas of the Buffer Zone.

RFPO will employ the most robust institutional controls possible. Institutional controls that require affirmative action to be undone are more robust than those that can be undone by inaction. The portion of Rocky Flats National Wildlife Refuge Act of 2001 (Refuge Act), which mandates that the Site be kept in Federal ownership is an example of a robust institutional control that can be undone only through an act of Congress. Other types of institutional controls may be used at Rocky Flats, where they demonstrably add to the long-term protectiveness of the remedy.

RFPO will consider whether to employ additional institutional controls based upon whether these institutional controls provide additional protection of human health and the environment. For example, a prohibition on well drilling in the industrial area may provide additional, desirable protection against a potential health risk. Should specific controls prove to be beneficial, RFPO will work to institute those controls in a manner so that they can remain effective over the life of the remedy.

RFPO believes that designation of Rocky Flats as a national wildlife refuge will help ensure the success of DOE's long-term stewardship activities at Rocky Flats, by providing a restrictive land use that encircles contaminated areas, and by mandating ongoing federal ownership. RFPO will work with the U.S. Fish and Wildlife Service to clearly delineate the areas retained by DOE at Rocky Flats, and to install administrative mechanisms that will prevent inadvertent intrusion into contaminated areas by Service personnel. This may include delineating areas that may not be used to construct refuge facilities. These controls may be a part of management documents prepared pursuant to the Refuge Act. They may also be a part of the long-term stewardship activities in the CAD/ROD, and/or post closure regulatory agreement.

Because of the refuge legislation, which mandates that nearly all of Rocky Flats remain in Federal ownership, RFPO believes that transfer of significant portions of the property is implausible. In the case of smaller transfers, such as easements, conveyance documents will need to clearly delineate all stewardship responsibilities, including institutional controls, associated with the property being transferred. DOE, however, will maintain overall responsibility for management of contamination and associated long-term stewardship at Rocky Flats; conveyance of an easement will not relieve DOE from liability or other obligation under CERCLA.

Physical controls such as fences, gates and roadblocks may be needed in limited areas to protect caps, covers or other engineered controls. RFPO will design its remedies to minimize the need for physical controls, within the constraints of cost-effectiveness and technical feasibility. DOE will retain the long-term responsibility for maintaining physical controls that are part of the remedy.

### Engineered Controls

RFPO has used engineered controls as part of some of the accelerated actions already conducted at Rocky Flats, and anticipates that others may be used. Many of the engineered controls that will remain after closure will serve the purpose of protecting surface water quality. Other engineered controls will likely include soil covers for historic landfills.

Engineered controls at Rocky Flats should be designed and selected to minimize the amount of necessary long-term management and maintenance, within the constraints of cost-effectiveness and technical feasibility, and consistent with the CERCLA criteria for remedy selection. This should reduce the future costs associated with long-term stewardship at Rocky Flats, and increase the long-term reliability of these controls should funding for stewardship become problematic in the future. In designing and choosing engineered controls, RFPO will consider the Site's environmental and ecological characteristics and natural processes to aid in immobilizing and containing contaminants. As an example, RFPO is examining using soil covers, rather than highly-engineered hazardous waste landfill caps, to restrict the movement of subsurface contamination, thus taking advantage of Site climate and vegetation types.

Within the constraints of cost-effectiveness and technical feasibility, RFPO will analyze actions that minimize the need for subsequent engineered controls. RFPO will likely also analyze monitored natural attenuation as a management technique for subsurface contaminants, where appropriate. Appropriate monitoring and institutional and/or physical controls will be adopted where monitored natural attenuation is used.

In consultation with the USFWS, RFPO will attempt to design and implement engineered controls that are compatible with the future land use of a national wildlife refuge. Caps and covers will be designed, to the extent practicable, to minimize the need for fences and other barriers that would interfere with wildlife habits and the ability of humans to enjoy the refuge. When revegetating disturbed areas, every effort will be made to utilize native species representative of nearby, undisturbed areas.

In designing its remedies, RFPO will take into account reasonably foreseeable natural events; one such design event may be the 100-year flood in the case of water management structures. Caps and covers may need to be designed with the expectation that prairie fires will occur on them. Design information will need to be retained to aid emergency responders, and to help determine if engineered controls are maintaining their integrity over the long term.

RFPO will consider the presence of off-Site engineered structures in designing and implementing on-Site engineered controls. As an example, RFPO will work closely with communities and local authorities operating downstream dams and water supply ditches to ensure that their operations can continue unaffected by long-term Site operations.

#### Monitoring, Maintenance and Periodic Review

Because of the anticipated presence of engineered controls and residual contamination that may restrict future use at Rocky Flats following closure, monitoring of the environment and maintenance of the remedy will likely be required. This monitoring will comprise the majority of the effort and expense associated with long-term stewardship at Rocky Flats, assuming that a remedy does not fail or that new contamination is not discovered. The length of time for which these activities may need to continue has not yet been determined, but they are anticipated to remain a Federal function. As a part of this function, DOE will need to conduct periodic reviews as required by CERCLA of environmental and engineering data, as well as emerging information on environmental toxicology, regulatory standards and surrounding land uses, to assess the continuing protectiveness of the cleanup and the long-term stewardship activities at Rocky Flats.

RFPO recognizes that the effectiveness of its long-term monitoring is largely dependent on sound characterization of the Site. RFPO will work closely with the regulators and the communities to ensure that Rocky Flats is well-characterized at closure, in order to best design monitoring that would be needed to adequately track residual contaminants, and to minimize the possibility that unknown contamination may manifest itself after cleanup is completed.

Within the constraints of cost effectiveness and technical feasibility, and consistent with CERCLA remedy selection criteria, RFPO will select and implement remedies that minimize the need for long-term monitoring or maintenance. For example, removal actions may be expanded beyond soil action levels if doing so will decrease long-term monitoring liabilities. The support of both the regulators and the community will be needed for this strategy to be cost-effective.

Long-term monitoring should be cost-effective and directed towards well-defined data quality objectives (DQO's). DQO's for long-term monitoring will be developed in close coordination with the regulators and the community. A process similar to the current Integrated Monitoring Plan (IMP) may be used to develop the long-term environmental monitoring at Rocky Flats. The need for, and extent of, long-term monitoring and maintenance requirements will be analyzed in the RFI-RI/CMS-FS, and appropriate monitoring and maintenance requirements will be described as part of the preferred alternative in the Proposed Plan. The resulting monitoring regime may be incorporated as part of any final CAD/RODs and in any modified RFCA consistent with RFCA Paragraph 286. Long term monitoring at Rocky Flats may include considerations such as monitoring the ongoing effectiveness of engineered controls and compliance with ever-evolving environmental standards.

The five-year review required under CERCLA will provide the minimum requirements for periodic review of the effectiveness of the Rocky Flats closure. However, RFPO recognizes that the community has a legitimate interest in more frequent reviews, and will consult with the community regarding the need for a review more frequent than the five-year period required by CERCLA. In order for the remedy to remain fully protective, the review of the remedy must be comprehensive. Therefore, periodic remedy reviews should address topics such as adequacy of Site institutional controls, advances in risk assessment, changes in surrounding land and water uses, and advances in monitoring and cleanup technologies. The frequency of CERCLA reviews will be contained in all final CAD/RODs.

### Information Management

Information management is a vital component of successful, protective long-term stewardship. Three general types of information should be preserved: historic information relating to Rocky Flats activities (including both production and closure), information relating to the remedy and residual contamination, and data collected during post-closure stewardship. Information will not only need to be preserved, but it must be accessible and understandable as well. While information management is to some extent a technical problem, successful information management depends on understanding the needs of the users. RFPO will therefore work closely with the community and its regulators to understand their information needs, and design its information management system with these needs in mind, using the current system as the starting point.

Activities at Rocky Flats have generated, and continue to generate, massive amounts of information. On an ongoing basis, this information is catalogued and prioritized for retention and accessibility. RFPO will undertake this effort in coordination with the communities prior to closure. RFPO recognizes that successful records management begins at the planning stages of a project. Therefore, each decision document produced at Rocky Flats through closure should contain an information management plan that will identify the records that will be retained from the project, and where and how they will be stored.

RFPO may use several locations to retain records. RFPO will establish a primary repository for Site records, which will also serve as the location for the CERCLA Administrative Record file. The exact site for this repository will be chosen in consultation with the community, and consistent with CERCLA requirements, but it may be located at a future Rocky Flats museum, a local university, community library, State or Federal regulatory agency, etc. Deed restrictions and covenants (if used) will be recorded and filed with the appropriate state or local agency. In addition to these primary repositories, RFPO will explore with the community the need for adjunct records repositories. RFPO believes that having multiple copies of critical records at more than one location could be an important aspect of a long-term records retention plan.

To the extent practical, RFPO will continue and expand its policy of making key documents and data available electronically and remotely. RFPO recognizes that electronic technologies for information storage have changed radically over the years and

that this change is likely to continue, threatening the long-term accessibility of electronically stored information. Therefore, a review of records retention methods should be conducted as an appropriate part of the periodic reviews that will take place after Site closure, and be closely coordinated with stakeholders.

#### Contingency Planning and Emergency Response

A sound, ongoing information management system will help determine when and if contingency plans should be implemented for the remedy. It may be necessary to invoke contingency planning if: a) monitoring results show that contaminants are moving farther or faster than had been assumed; b) monitoring indicates the presence of significant, previously unknown contaminant sources; or, c) field data show that engineered controls are losing their integrity. For each of these cases, historic monitoring data and design information would need to be available in a useable format to compare the current condition with historic information. Data would need to be sufficient to provide sound technical reviews of remedy effectiveness, reviews that will need to be done on a regular basis pursuant to CERCLA. Contingency planning will be done as needed as the remedy nears completion, to ensure protection of human health and the environment, and may be a part of any final CAD/RODs and in any modified RFCA consistent with RFCA Paragraph 286.

RFPO recognizes that emergency response may be necessary at Rocky Flats in the case of wildfires, floods, or other natural disasters. Environmental data and design information should be retained in a way that is useful to emergency responders. Maps of residual contamination and assessments of hazards associated with residual contamination should be retained over the long-term in order that emergency personnel can respond with confidence and in safety to the events that take place at Rocky Flats following closure.

RFPO recognizes the importance of strong contingency planning to surrounding communities. RFPO also recognizes that surrounding communities may be relied upon to provide emergency response to the Site after closure. Therefore, RFPO plans to conduct a strong public involvement process, particularly with local governments, in both of these areas.

## **Part Two: Planning Considerations for Rocky Flats Long-Term Stewardship Activities**

### Introduction

This part of the *Strategy* is intended to provide more specific information for individual components of long-term stewardship at Rocky Flats. The chapters in this part reflect the topics addressed in Part One of this document, and include regulatory authorities; institutional and physical controls; engineered controls; monitoring, and periodic review; information management; and contingency planning and emergency response. In addition, this part of the *Strategy* includes current estimates of long-term stewardship costs.

This part of the *Strategy* is of necessity somewhat speculative, for two reasons. First, significant parts of the remedy (and the post-closure regulatory regime) have yet to be decided upon. Without these decisions, many of the specifics regarding the need for engineered and institutional controls, the types of monitoring that will be needed, etc., cannot be known with certainty. Second, DOE is now developing many of its complex-wide policies for long-term stewardship, a current example being policies on long-term information management. These DOE-wide policies will influence, and be influenced by, plans for long-term stewardship being developed at Rocky Flats.

Notwithstanding the forward-looking nature of this part of the *Strategy*, RFPO believes that it will provide a means for our stakeholders to be aware of, and to provide input to, specific stewardship planning at Rocky Flats as it takes place. In addition, RFPO will update this part of the *Strategy* on a regular basis, to capture specific stewardship needs as they become known, such as when individual interim actions are completed.

### Chapter One

#### ***Regulatory Authorities for Long-Term Stewardship Activities***

##### **General Considerations**

DOE is committed to maintain post-cleanup controls at Rocky Flats, and the RFCA Parties anticipate that enforceable post-closure requirements will exist to ensure the protectiveness of the remedy in accordance with the CERCLA remedy selection process and the corrective action and closure process in RCRA/CHWA. The need for, and extent of, long-term stewardship activities will be analyzed in the RCRA Facility Investigation-Remedial Investigation/Corrective Measures Study-Feasibility Study. Appropriate requirements for long-term stewardship activities will be described as part of the preferred alternative in the Proposed Plan. Appropriate requirements will be contained in all final CAD/RODs and in any modified RFCA consistent with RFCA Paragraph 286.

Alternatively, the RFCA Parties may elect to negotiate an entirely new regulatory agreement for Rocky Flats after closure.

The specific provisions in a post-closure regulatory agreement have yet to be negotiated; however, such an agreement could be implemented through a modification of the current RFCA, consistent with RFCA Paragraph 286. RFCA is a Federal Facility Agreement and Consent Order signed by DOE, EPA and CDPHE. RFCA recognizes the state's authorities to enforce provisions of the CHWA and environmental permits issued by CDPHE through its normal regulatory and enforcement mechanisms. EPA and CDPHE entered into RFCA pursuant to their statutory and regulatory authorities under CERCLA, RCRA and the CHWA. Further, RFCA recognizes the state's standing to enforce the CERCLA provisions of RFCA as a "person" under section 310 of CERCLA. Among other things, RFCA regulates contaminants in surface water, groundwater, and surface and subsurface soils caused by releases of hazardous substances, including hazardous wastes (see RFCA Attachment 5), and contains specific provisions regarding enforceability and penalties.

The parties to RFCA anticipated the need for a follow-on regulatory agreement after the remedy was complete. RFCA Paragraph 286 states that, following removal of the Site from the CERCLA National Priorities list, "all parties shall commence negotiations for appropriate modification of this Agreement which considers among other things the continuing requirements of any CAD/RODs being implemented at the Site at the time." It is unclear at this time how DOE's ongoing, post-closure requirements would be captured. Specifically, as of the date of this document, DOE and CDPHE have not reached agreement as to whether a post-closure permit (or, alternatively, an enforceable document as defined in 6 CCR 1007-3, 100.10 (d)) will be required for Rocky Flats, and if so, whether that permit (or enforceable document) will also contain appropriate requirements for long-term stewardship activities. The RFCA Parties will endeavor to resolve this matter.

#### Potential Scope of Long-Term Stewardship Activities in Regulatory Documents

Many of the long-term stewardship activities undertaken at Rocky Flats will be done for the express purpose of maintaining the long-term protectiveness of the remedy. RFPO anticipates that it is these kinds of activities that would be analyzed in the RFI-RI/CMS-FS. Some of the activities that RFPO believes would be analyzed in this process, and that could be proposed as part of the preferred alternative in the Proposed Plan include:

- implementing institutional controls that are intended to prevent unacceptable exposure to hazardous substances, protect engineered controls or prevent exceedences of environmental standards;
- continued maintenance of engineered controls, to provide for their ongoing effectiveness over the life of the remedy;
- ongoing environmental monitoring to determine the effectiveness of the remedy;
- maintenance of environmental data and other information relevant to the remedy; and,



- periodic review of the remedy and, if need be, alteration of the remedy.

At this point, RFPO believes that its long-term stewardship activities could be contained in a single post-RFCA agreement, as opposed to multiple agreements and permits. This is RFPO's preferred means of addressing long-term stewardship activities, and RFPO intends to work with the other RFCA parties to determine the feasibility of this approach.

Following Site closure, DOE expects to work with its regulators and stakeholders, and may choose to undertake certain activities that would not be directly related to the protectiveness of the remedy, and so would not be part of an enforceable agreement. Such activities may include providing grants to stakeholder groups, funding a Rocky Flats museum, determining the number and types of reading rooms, etc.

### Environmental Covenants

Section 25-15-320 of the Colorado Revised Statutes requires an environmental covenant under certain conditions. As of the date of this document, DOE and CDPHE have not reached agreement on the applicability of the State environmental covenant to the federal government, although they hope to reach resolution on this issue. Failing an agreed-upon resolution, each party reserves its rights as provided in RFCA Part 18.

### Authority and Accountability

As mentioned above, the legal authority under which DOE conducts long-term stewardship activities at Rocky Flats will be contained as appropriate in one or more regulatory documents. This is an item of ongoing discussion among the RFCA parties. Per the Rocky Flats National Wildlife Refuge Act, DOE will retain administrative jurisdiction over certain property needed for the response actions. DOE intends to work with the U.S. Fish and Wildlife Service to determine whether there are activities at Rocky Flats, such as law enforcement, that could be efficiently performed by Service personnel consistent with their duties at the Refuge.

## Chapter Two

### ***Institutional and Physical Controls***

#### Definitions and General Approach

As discussed in the first part of the Strategy, institutional controls and physical controls are long-term stewardship measures that are put into place to prevent exposures to residual contamination that would pose an unacceptable public health risk. In general, these kinds of controls do not affect the mobility or toxicity of contaminants; this is the function of engineered controls, which are discussed in the following chapter. Institutional controls consist largely of administrative controls designed to deter behavior that poses unacceptable risks. Common forms of institutional controls include deed restrictions and prohibitions on well drilling and water use. Physical controls include

things like fences and gates that restrict access, as well as additional site security measures such as guards and alarms. In addition to keeping people away from areas of contamination, physical controls serve an important function by securing treatment systems and monitoring equipment from vandalism or other unwanted intrusions. Physical controls such as fences or subsurface biota barriers can be used to keep animals away from contaminated areas.

DOE will establish institutional controls and implement physical controls after closure, as appropriate to ensure the long-term protectiveness of the remedy. The need for and extent of specific institutional controls have not been determined and will be analyzed in the RFI/RI-CMS/FS. Appropriate requirements for institutional controls will be contained in all final CAD/RODs and in any modified RFCA consistent with RFCA Paragraph 286. To help facilitate the ongoing effectiveness of institutional controls, consistent with the provisions of the Refuge Act, DOE may choose to retain administrative jurisdiction over those individual portions of the Site for which required institutional controls are established, following transition to a national wildlife refuge. Such an arrangement could help ensure DOE's continuing ability to monitor and control activities over those portions of the Site. One scenario for accomplishing this could be for USFWS to propose management plans for areas controlled by DOE, with DOE approving such plans, if they are consistent with the goals of the remedy. In this manner, the Site could be managed for its ecological values, while still ensuring that the effectiveness of the remedy (which is the paramount goal) is maintained. Many stakeholders believe that a local (or at least regular) DOE presence for Rocky Flats oversight could be useful to ensure that management plans are implemented as designed.

#### Possible Types and Extent of Institutional Controls

The selection of individual institutional controls will be dependent on the final remedy selection, and cannot be known at this time. Institutional controls will be part of the final remedy as appropriate to ensure the protection of human health and the environment. They may be used in the following areas:

- *Areas of known or possible subsurface soil contamination* - - Several areas of the Site have areas of known or possible subsurface contamination. The Industrial Area has areas of subsurface contamination that are associated with releases from storage tanks, that may be associated with under-building contamination, or that may be associated with releases from the Original Process Waste Lines (OPWLs). Taken together, these areas potentially comprise most of the Industrial Area east of the 130 Building complex. Typical contaminants include volatile organic compounds (VOCs) and metals, although the OPWLs carried a wide variety of hazardous substances. Other places outside of the Industrial Area may have subsurface soil contamination; these include the East Trenches, Ash Pits, Present Landfill, and the area beneath the 903 Pad. For these areas, an institutional control that would preclude excavation or other intrusion into this contamination may be appropriate. Additionally, a prohibition on construction of new buildings in the Industrial Area may be appropriate, to prevent a scenario such as an office

worker being exposed to residual VOC contamination via an indoor air pathway.

- *Areas of groundwater contamination* - - Several groundwater plumes, whose nature and extent are reasonably well characterized, exist in and around the Industrial Area. These include VOC plumes in the central Industrial Area, the Property Utilization and Disposal (PU&D) Yard, and in the 903 Pad/East Trenches area. Another area of shallow groundwater contamination by nitrates (primarily) and uranium is found in the vicinity of the Solar Ponds. A prohibition on drilling wells in areas where groundwater contaminant concentrations exceed drinking water standards or maximum contaminant levels will be used as appropriate. This would be important not only to prevent human exposure to groundwater contaminants, but also to prevent adverse effects on the remedy, such as by causing spread of contamination.
- *Certain areas of surface soil contamination* - - A plume of surface soil contamination extends eastward from the 903 Pad, across the eastern Buffer Zone to the Site boundary. RFPO anticipates that soil will be removed from this area so that no unacceptable risks would be posed to the anticipated future users (wildlife refuge workers and visitors to the refuge). However, RFPO believes that avoiding soil disturbances in areas with this type of residual contamination would be beneficial. In order to minimize surface disturbance in these areas, limitations on surface soil disturbance (e.g., allowing only limited disturbance with strict erosion controls) will be used as appropriate.
- *Areas with engineered controls* - - RFPO anticipates that there will be a number of engineered controls that will remain in place following Site closure. Some of these, such as the groundwater barriers and passive treatment system for the Mound Plume, East Trenches Plume, and Solar Ponds Plume, are in place now and will need protection, assuming they remain in place for the long term. One or more additional such treatment systems may be in place at closure and would need similar protection. RFPO also anticipates that an engineered cover will be in place for the Present Landfill, and this is one alternative being considered for the Old Landfill (these decision documents are being written at the time of the writing of the draft of the *Strategy*). Prohibitions on excavations on or in the vicinity of engineered controls will probably be needed. Other restrictions, such as exclusion of vehicles or pedestrian traffic, will be used as appropriate, depending on the design of the engineered control.

When delineating those areas subject to institutional controls, DOE will likely do so simply and conservatively, that is, without drawing tight, convoluted boundaries around areas of known or suspected contamination. This would allow for delineation of these areas without the need for substantial additional characterization, and would also allow for some future spread of contamination, as may happen in uncontained groundwater plumes. This would also allow future land managers the benefit of simple, straightforward boundaries when planning land management activities. RFPO believes that most of these controls (such as restrictions on soil disturbance, excavation or drilling wells) will not affect the ability of USFWS to manage the area, or the ability of the public

to enjoy it. The revisions to RFCA Attachment 5 contain a map showing the potential extent of institutional controls after closure (Figure 10).

### Possible Types and Extent of Physical Controls

In remediating the Site, it will be RFPO's goal to minimize the need for long-term physical controls (consistent with CERCLA remedy selection criteria), although some will probably be needed. Some of the circumstances for which physical controls may be required at Rocky Flats following closure are described below:

- *Protection of engineered controls* - - Certain engineered controls, such as covers, may not be conducive to pedestrian traffic, either because of slope stability issues or because of concerns regarding maintenance of the vegetation upon which the function of the covers depends. In such cases, low-impact fences with locked gates and warning signs may be appropriate access controls; the extent and need for these controls would depend on the design of the engineered control.
- *Security of monitoring systems* - - Monitoring systems may or may not be located in areas where jurisdiction is retained by DOE, making their long-term protection an important consideration. Monitoring wells that are still in use will need to be clearly marked to prevent their unintentional destruction, and securely locked. All fixed monitoring equipment (such as surface water and air monitors) still in use will need to be protected from vandalism or other intrusions. Such equipment will probably require combinations of signs, locks and security fencing to preclude unpermitted access.
- *Delineation of property controlled by DOE* - - Consistent with the requirements of the Refuge Act, DOE will retain administrative jurisdiction over certain portions of the Site following closure. As mentioned, there will be, where appropriate, institutional controls in place on the lands controlled by DOE, that would preclude certain activities there. It may therefore be useful to future Site personnel, including USFWS, to have physical structures such as fences or markers for the purpose of demarcating those lands controlled by DOE. These structures would not need to be obtrusive, since they would not be intended to preclude access, but would need to clearly indicate the location of DOE lands, as well as the activities prohibited there. Delineation might also be accomplished in even less obtrusive ways, such as by use of global positioning systems.
- *Security patrols* - - There may be a need following Site closure for regular security patrols to protect treatment and monitoring equipment from vandalism. This could be performed by DOE or one of its contractors, or by USFWS. DOE is currently exploring joint jurisdictional arrangements with USFWS for lands that would be retained by DOE, that could give USFWS law enforcement authority on lands retained by DOE.

DOE will consult with USFWS in the design and implementation of post-closure physical controls, to ensure that they are consistent with wildlife refuge management goals to the extent possible, consistent with the requirements of the remedy. DOE does not anticipate

the need to build fences or other structures to preclude access to lands that it retains after cleanup and closure, except in the limited instances described above.

### The Role of the Refuge in Institutional and Physical Controls

While not directly related to the Rocky Flats remedy, the establishment of a wildlife refuge over most of the Site could strengthen remedy-related institutional controls. Some of the potential benefits may be:

- *Maintenance of perimeter fencing and control of Site access* - - USFWS will likely be responsible for maintaining a fence around the perimeter of the Site after closure. The type of fencing that will be used will be addressed in the Comprehensive Conservation Plan (CCP) being developed by USFWS. USFWS will also have the option of locking gates at Site entrances, which would limit vehicle traffic. Decisions regarding what types of public access, if any, will be allowed at Rocky Flats will be made during the CCP process.
- *Maintenance of an additional Federal presence at the Site* - - Depending on the type of management that USFWS chooses to perform, USFWS personnel could be at Rocky Flats on a more or less regular basis. These personnel could be trained in the types of stewardship controls present at the Site, and could be available to alert DOE to changes in Site conditions. The type of management and number of personnel that might be needed on Site will be determined in the CCP process.
- *Precluding residential development at Rocky Flats* - - The Refuge Act itself already provides a strong control against private residential development, by ensuring continued Federal ownership. While levels of contamination over most of the Site would not preclude the building of a residence (say, for refuge workers), RFPO presumes that there will be no residential development at Rocky Flats. This presumption is made by the RFCA parties in the revisions to RFCA Attachment 5. The CCP process will determine the need, if any, for on-site housing for refuge workers.

USFWS expects to produce a draft CCP by 2004.

## Chapter Three

### ***Engineered Controls***

#### Definitions and General Approach

As discussed in the first part of the *Strategy*, engineered controls are physical structures that are implemented in order to treat residual contamination, isolate contamination and/or limit its spread. Common types of engineered controls include caps and covers, groundwater barriers, groundwater treatment systems, dams, and surface water diversions.

No final remedy has been selected for Rocky Flats; this will be done in the final CAD/ROD for Rocky Flats. However, given the types and nature of the residual contamination that is likely to remain at Rocky Flats following closure, and considering the geologic and hydrologic features of the Site, the following kinds of engineered controls are likely to remain after remediation is complete:

- 1) Groundwater barriers and passive groundwater treatment systems;
- 2) Landfill covers; and,
- 3) Water management structures.

Each of these types of engineered controls is discussed below, including specific discussions of the structures that exist or may be constructed in the future. Also discussed are the stewardship implications of individual engineered controls, including attendant institutional controls, monitoring requirements, and long-term maintenance needs.

### Groundwater Barriers and Treatment Systems

Groundwater contamination is found in the shallow aquifer in and around the Industrial Area, in the Rocky Flats Alluvium. This groundwater is perched atop impermeable bedrock, and in some cases reaches surface water, causing the potential for surface water contamination. Groundwater contaminants include solvents, nitrate and uranium. Given the Site's subsurface hydrology and assuming that contaminants are not removed from groundwater by other means, DOE is using and will continue to use groundwater barriers and passive treatment cells to redirect and treat contaminated groundwater before it enters surface water. Three of these systems are already in place, and one more additional system is contemplated.

*The Mound Treatment System* - - The Mound treatment system was the first groundwater barrier and treatment system constructed at Rocky Flats, and was completed in September 1998. The Mound treatment system was designed to intercept and treat groundwater contaminated with volatile organic compounds (VOCs) in a plume emanating from the former Mound drum disposal site. The groundwater plume addressed by the Mound treatment system flows in a northerly direction towards South Walnut Creek. Tetrachloroethylene (or perchloroethylene, PCE) and trichloroethylene (TCE) are the predominant contaminants in the groundwater; PCE concentrations have been measured as high as 528,000 micrograms per liter (ug/l), and TCE concentrations have been found up to 18,000 ug/l. Contaminated soil remaining in the Mound disposal area was removed in order to eliminate the ongoing source of VOC contamination in the area.

The Mound treatment system uses a barrier of interlocking high-density polyethylene (HDPE) sheets to capture groundwater. The individual sheets are about twenty feet wide and fifteen feet long, and are sealed against the bedrock with bentonite, about ten to sixteen feet below ground surface. The HDPE barrier extends about 230 feet in a generally east-west direction, south of South Walnut Creek. Water is collected in a four-inch, perforated HDPE pipe set in pea gravel along the base of the barrier wall, and water is piped to a central collection sump. The sump is then piped to two below-grade

treatment cells. The treatment cells are cylindrical vessels made of HDPE, measuring about ten feet in diameter by eleven feet tall. They contain zero-valent iron filings, pea gravel, and a gravel/iron mixture. Zero-valent iron is used to treat the VOCs in groundwater. Treated groundwater is returned to the downgradient groundwater by means of a French drain. Monitoring points were installed to measure system performance, and groundwater monitoring wells remain to measure VOC concentrations in the upgradient plume.

The Mound treatment system has performed as designed, and has been effective in reducing VOC concentrations in the water passing through the treatment cells. Recent data show that groundwater entering the treatment cells had PCE and TCE concentrations of about 50 ug/l and 75 ug/l, respectively, which were reduced to less than detection levels in the groundwater discharged from the system.

*The East Trenches Treatment System* - - The East Trenches treatment system was the second groundwater treatment system to be installed at Rocky Flats, and was completed in September 1999. The groundwater contaminant plume treated by the East Trenches system emanates primarily from the area of disposal Trenches T-3 and T-4, which were remediated in 1996. The plume flows in a generally northerly direction from the trenches towards South Walnut Creek. The East trenches plume is located just east of the Mound Plume. The groundwater contaminants are PCE, which has reached concentrations of 6,800 ug/l, 1,1-trichloroethane, which has reached concentrations of 730 ug/l, and carbon tetrachloride, which has reached 460ug/l. The East Trenches area also has uranium contamination in soils, which has been measured at levels as high as 3,240 pCi/g.

Overall system design is similar to that of the Mound treatment system. The East Trenches treatment system uses a series of interlocking HDPE panels as a groundwater barrier; the panels are about fifteen feet wide and of varying length depending on the installation depth. The panels are sealed against the bedrock with bentonite, about ten to sixteen feet below ground surface. The HDPE barrier extends about 1,200 feet in a generally east-west direction, south of South Walnut Creek. Water is collected in a four-inch, perforated HDPE pipe set in pea gravel along the base of the barrier wall, and water is piped to a central collection sump. The sump is then piped to two below-grade treatment cells. The treatment cells are cylindrical vessels made of HDPE, measuring about twelve feet in diameter by thirteen feet tall. They contain zero-valent iron filings, pea gravel, and a gravel/iron mixture. Zero-valent iron is used to treat the VOCs in groundwater. Treated groundwater is returned to the downgradient groundwater by means of a French drain. Monitoring points were installed to measure system performance, and groundwater monitoring wells remain to measure VOC concentrations in the upgradient plume.

The East Trenches treatment system has performed as designed, and has been effective in reducing VOC concentrations in the water passing through the treatment cells. Recent data show that groundwater entering the treatment cells had PCE concentrations of 240-360 ug/l, TCE concentrations of 2,500-2,900 ug/l, and chloroform concentrations of 84 ug/l. Nearly all of these contaminants were reduced to below detection levels in the

groundwater discharged from the system. The single exception was one sample result for PCE, which was recorded at 5.3 ug/l.

*The Solar Ponds Plume Treatment System* - - The Solar Ponds plume treatment system was constructed concurrently with the East Trenches treatment system, and was also completed in September 1999. This system treats contaminated groundwater that emanates from the Solar Ponds, which received and leaked industrial wastewater containing nitrates and uranium. The resulting groundwater plume flows generally northward from the Solar Ponds towards North Walnut Creek. An Interceptor Trench System (ITS), constructed in 1981 (and replacing earlier trenches constructed in 1971) collected approximately 2.4 million gallons of groundwater from the Solar Ponds plume annually, which was transferred from a pump house, ultimately to Building 374 for treatment. Some contaminated groundwater was not collected by the ITS, and entered North Walnut Creek. Nitrate concentrations at the pump house have been measured at about 220 milligrams per liter (mg/l) as nitrogen. Uranium concentrations have been measured at 61 pCi/l there. However, uranium concentrations in groundwater are higher near the Solar Ponds themselves.

The Solar Ponds plume treatment system uses a series of interlocking HDPE panels as a groundwater barrier; the panels are about fifteen feet wide and of varying length depending on the installation depth. Hydrophilic cords were placed along the interlocking portions of the panels; the cords are designed to swell when wet and further seal the seams. The panels are sealed against the bedrock with bentonite, and the tops of the panels are about five to ten feet below ground surface. The HDPE barrier extends about 1,100 feet in a generally east-west direction, south of North Walnut Creek, and is designed to catch water collected by the existing ITS. Water is collected in a four-inch, perforated HDPE pipe set in pea gravel along the base of the barrier wall. The treatment cells for the Solar Ponds plume are located in a 46-foot by 21-foot concrete, below-grade vessel. Two separate cells are located in the vessel. The first cell contains a mixture of leaf mold, sawdust, and zero-valent iron, to induce denitrification and to remove soluble uranium. The second cell contains zero-valent iron to complete uranium removal, if needed. Due to concerns surrounding habitat disturbance of the Preble's Meadow Jumping Mouse, the treatment cell was not placed adjacent to North Walnut Creek. Therefore, about twelve feet of hydraulic head was required in the system for water to begin entering the treatment cells. To help aid this situation, a solar-powered pump was installed in September 2002, to direct more water to the treatment cells. Piezometers and monitoring wells are in place to evaluate system performance.

The treatment cells have proven to be effective at removing both nitrates and uranium from groundwater. Nitrate concentrations have been reduced from 110-212 mg/l at the inlet of the treatment cells, to less than one mg/l in water leaving the treatment cells. Uranium concentrations dropped from around 25 pCi/l to less than 0.2 pCi/l. However, contaminated shallow groundwater continues to enter North Walnut Creek from portions of the Solar Ponds plume, and concentrations of nitrates and uranium had not dropped in the creek as of December 2001.



*The North Industrial Area Treatment System (under consideration)* - - A fourth groundwater treatment system may be installed in the future to capture contaminated groundwater from the northern Industrial Area. Some of this contaminated groundwater is migrating, albeit slowly, towards North Walnut Creek. No surface water contamination has yet been observed as a result of this groundwater contamination, which is predominantly VOCs. If installed, this system will likely have a design similar to the Mound and East Trenches treatment systems. A decision document addressing a possible treatment system for groundwater from the Industrial Area is expected in 2003.

*Stewardship Activities for Groundwater Treatment Systems* - - To the extent that the groundwater treatment systems remain in place following cleanup and closure of Rocky Flats, the long-term stewardship activities that will likely be required for these treatment systems to remain effective include the following:

- Institutional controls will be used, as appropriate, in the area of the barrier wall and treatment cells to prevent excavation or other intrusions that could compromise the barrier's integrity. Additionally, an institutional control preventing the pumping of groundwater in the groundwater plumes themselves will be used, as appropriate, to prevent exposure to remaining contamination, and to ensure that groundwater flow patterns are not disturbed. DOE will likely retain administrative jurisdiction over property with groundwater treatment systems, to help ensure the success of any needed institutional controls, as required by the Refuge Act.
- Physical controls will need to be maintained to delineate the presence of the treatment cells, and to preclude unwanted access. Physical controls will likely include locks and fencing, which are currently in place for the systems already constructed.
- Long-term maintenance is anticipated to include periodic replacement of the media in the treatment cells, which may be needed about every ten years, depending on system performance. If replaced, this media would need to be characterized and disposed of as appropriate. The media is also raked periodically to ensure that water continues to flow through the treatment cells, a practice that will also continue while the cells remain in place. While no maintenance is anticipated for the HDPE barriers, piezometers will be monitored for changes in groundwater levels, which could indicate a breach in a barrier. The pump that was recently installed at the Solar Ponds plume treatment system will require periodic maintenance while the system remains. Finally, physical controls will need to be inspected on a regular basis while the treatment systems remain in use, and will likely need some maintenance. At this time, RFPO believes that the passive groundwater treatment systems at Rocky Flats could be needed for as long as 75-100 years. RFPO also believes that, with proper maintenance, these systems will last for as long as they are needed.
- Long-term monitoring will be conducted as appropriate. In addition to monitoring groundwater levels as described above, groundwater leaving the systems will likely need to be monitored as appropriate to ensure that the systems continue to perform as designed. Additionally, groundwater in the upgradient plumes will likely continue to be monitored as appropriate, to

provide an indication of the effectiveness of the systems, and to decide when the system can ultimately be abandoned.

- Relevant information will be maintained as appropriate. This may include decision documents, plans, as-built designs and closeout reports, as well as environmental monitoring data relating to groundwater levels, treatment system effectiveness, and contaminant levels in upgradient groundwater plumes.

Projected costs for these activities are found in Chapter Seven.

### Engineered Covers

At least one, and possibly two, remedial actions at Rocky Flats may involve construction of engineered covers as part of the remedy. These remedial actions are the so-called Present Landfill and the Original Landfill. For both landfills, a soil cover is being considered. Also discussed in this section is the remedial action for the Solar Ponds. This remedial action does not rely on an engineered cover; the remedial activity at this site included removal of contaminated “hot spots”, and the area was regraded and revegetated as a best management practice.

*The Present Landfill* - - The Present Landfill is located north of the Industrial Area at the head of No Name Gulch, the drainage immediately to the north of North Walnut Creek. Disposal operations began there in 1968, and continued until 1998. The landfill was originally intended as a sanitary landfill to receive uncontaminated solid wastes such as office trash, construction debris, scrap metal, etc. However, the landfill also received hazardous wastes streams (such as paints and solvents), beryllium-contaminated materials, asbestos-containing materials, PCBs from fluorescent light ballasts, and radioactively contaminated sludge from the Rocky Flats Sewage Treatment Plant. The landfill occupies about twenty acres, and is unlined. Waste thickness reaches forty feet along the eastern face of the landfill. East of the landfill is the East Landfill Pond, which is a body of water that exists year-round, occupying about 2.5 acres, with a 7.5 million gallon capacity. Seepage from the eastern face of the landfill discharges to the pond by means of a passive treatment system consisting of stepped flagstones and gravel, which are designed to remove low levels of VOCs that occur in the seepage. Water from the East Landfill Pond is periodically pumped to Pond A-3 in North Walnut Creek.

RFPO is currently discussing remedial alternatives for the Present Landfill with the regulators. The accelerated action that is ultimately selected will likely include a soil cover of some type, although the precise design criteria have not yet been selected.

*Stewardship Activities for the Present Landfill* - - The Present Landfill cover, assuming it is constructed, and associated waste will remain indefinitely following Rocky Flats closure. Stewardship activities associated with the Present Landfill remedial action could include the following, but will be dependent on the design of the final remedy:

- Institutional controls could be required for several reasons. A prohibition on excavation or surface disturbance would maintain the integrity of the vegetative cover, and prevent unintentional intrusion into the waste itself. There is

anticipated to be no need to restrict access to the cover because of contamination concerns, and the cover is expected to be able to bear some foot traffic. However, heavy foot traffic or vehicular traffic could remove vegetation and affect cover performance. Therefore, these activities would need to be restricted. DOE anticipates retaining the Present Landfill site following closure, to help ensure the success of any needed institutional controls.

- Physical controls may be required. These may include low-impact fences to deter access and delineate the site, although access could be discouraged by simply not constructing trails or roads in the area. Additional fencing may be required to secure monitoring locations, and locks may be required for features such as monitoring wells to prevent unwanted intrusion.
- Long-term maintenance could be required. This might include fertilization and irrigation of the cover vegetation, as needed; inspection and maintenance of storm water diversion systems; inspection and maintenance of the soil cover itself, in case of erosion or settling; maintenance of monitoring systems; and, maintenance of any needed physical controls such as fences. If the East Landfill Pond remains, the dam will need regular inspection and maintenance.
- Long-term monitoring will likely be needed. This will likely include monitoring of surface water leaving the landfill, until it is determined that the seepage poses no danger to surface water; monitoring of groundwater levels and quality in the area; and performance monitoring of the cover itself, to evaluate the infiltration rate of precipitation through the cover.
- Relevant information will need to be maintained as necessary. This will likely include decision documents, plans, as-built designs and closeout reports, as well as environmental and performance monitoring data.

Projected costs for these activities are found in Chapter Seven.

*The Original Landfill* - - The Original Landfill occupies about twenty acres on the north side of Woman Creek, immediately south of Building 460. The Original Landfill operated as a waste dump from the opening of Rocky Flats in 1952, until the construction of the Present Landfill in 1968. The landfill contains about 70,000 cubic yards of waste of various types, including construction debris, concrete, scrap metal, etc. The landfill also contains solvents, paints, oils, pesticides, and items contaminated with beryllium and uranium. About twenty kilograms of uranium-238 (known as depleted uranium) ash are thought to have been disposed of in the landfill. The landfill is located on steep, unstable slopes. While a soil cover was placed on the landfill after 1968, debris is exposed in some areas. Contamination in the Original Landfill is sporadic. Surface soils exceed RFCA action levels at four locations for radionuclides and one location for non-radionuclides. No subsurface samples have yet shown contamination in excess of any RFCA action levels. Uranium-238 exceeds RFCA action levels in groundwater in two monitoring wells within the landfill boundary, although the Original Landfill does not appear to be affecting surface water in Woman Creek. The landfill extends close to areas of Woman Creek that serve as habitat for the threatened Preble's Meadow Jumping Mouse, a situation that could complicate remediation.

The remedial approach for the Original Landfill has not been determined. However, four general alternatives have been discussed for the Original Landfill accelerated action, as follows:

- The no action alternative would leave the waste in place, with no removal or cover. Under this alternative, access to the site would be restricted, possibly by a large, chain-link fence. Preliminary estimates indicate that this fence would be about 4,000 feet long. Environmental monitoring would continue to watch for future impacts to surface water. The site would be walked down on a regular basis, to identify any waste that had surfaced. Slope stability would also be monitored.
- A cut and fill stabilization with a soil cover would entail an initial removal of surface soils that exceeded RFCA Tier I action levels. This would be followed by regrading the waste fill area to a constant 18% slope using a cut and fill approach. A groundwater cutoff wall about 1,700 feet in length would be constructed upgradient of the waste fill area to dewater the area and increase slope stability. Finally, a soil cover would be placed on top of the waste, and the cover would be revegetated using a native seed mix.
- A retaining wall stabilization with a soil cover would not disturb the waste fill area, which would be regraded by adding clean fill until a constant 18% slope was achieved; about 170,000 cubic yards of fill would be imported for this purpose. As with the previous alternative, this alternative would use a groundwater cutoff wall, and a soil cover over the waste fill area. This alternative would add a retaining wall about 1,300 feet long that would extend ten to fifteen feet above ground surface at a 3:1 slope. The retaining wall would be built atop bedrock, and would extend 20-30 feet below ground surface.
- Removal of the waste fill from the Original Landfill would entail excavation, characterization and appropriate disposal of approximately 160,000 cubic yards of material. Disposal could be at an off-site location, with solid waste perhaps being disposed of at a local commercial facility. Alternatively, waste fill classified as solid waste could be disposed of on-site, possibly at a site adjacent to the Present Landfill. After removal of the waste fill, the Original Landfill would be backfilled, regraded and revegetated.

Additional alternatives for the Original Landfill may be discussed among RFPO, the regulators, and the community. Ultimately, remedial alternatives for the Original Landfill will be discussed in further detail in the Draft Original Landfill IM/IRA Decision Document, expected after mid-2003.

*Possible Stewardship Implications of Original Landfill Alternatives* - - Since the alternatives for the Original Landfill are still under development, a discussion of their stewardship implications is necessarily somewhat speculative. However, potential stewardship activities associated with the aforementioned alternatives could include the following:

- A no-action alternative would require institutional controls to preclude access to the remaining waste fill, and prevention of excavation or other disturbance at the Original Landfill site. Physical controls (chain-link fencing and signs) would be used to restrict access; these controls would need regular inspection

and maintenance. Environmental monitoring would continue, and regular walk-downs of the waste fill area would take place to identify any exposed material; this could also entail additional soil sampling. DOE would likely retain the Original Landfill site after closure under this alternative.

- Alternatives that involve construction of a soil cover (with or without a retaining wall) would have stewardship implications generally similar to those for the Present Landfill. Institutional controls would involve restrictions on excavation in the area of the waste fill to prevent intrusion, and limitations on soil disturbance and heavy traffic on the cover itself. Monitoring would include continued environmental monitoring of surface and groundwater; and performance monitoring of the cover and the groundwater cutoff wall. Inspection and maintenance of all engineered components of the remedy would be required, as would the maintenance of any fences or other physical controls that might be used. DOE would likely retain the Original Landfill site after closure under this alternative.
- Complete removal of the waste would lessen the long-term stewardship activities at the Original Landfill Site. Long-term institutional controls would not be needed, although short-term access restrictions could be used to encourage revegetation. Environmental monitoring may be reduced or eliminated. Under a removal alternative, DOE would likely not retain the Original Landfill. However, if the waste from the Original Landfill were to remain elsewhere onsite, significant stewardship activities, including institutional controls, environmental and performance monitoring, and maintenance would likely be required. DOE would likely retain administrative jurisdiction over the site that received the waste.

All of the alternatives being considered would require appropriate retention of information, including decision documents, site plans, as-built drawings, closeout reports, environmental data, etc. The stewardship implications of these alternatives will be discussed in greater detail in the Draft Original Landfill IM/IRA Decision Document.

*The Solar Evaporation Ponds Closure* - - The Solar Evaporation Ponds are located in the northeast portion of the Industrial Area, on a flat expanse of land south of and overlooking North Walnut Creek. There are five existing ponds. The first pond was constructed in 1953, and the last was placed into service in 1970. They were operated primarily to store and evaporate radioactive process wastes and neutralized acidic process wastes, containing less than 100,000 pCi/l of long-lived alpha radioactivity. Numerous types of materials are believed to have been introduced into the ponds over time, including radioactively contaminated aluminum scrap, leachate from the sanitary landfill, alcohol wash solutions, waste radiography solutions, treated sanitary effluent, groundwater from the ITS, and a variety of other substances. Routine placement of liquid wastes into the ponds ceased in 1986. However, leakage from the ponds has contaminated shallow groundwater in the area with nitrate and uranium, which are being addressed through the Solar Ponds Plume groundwater treatment system described earlier. Liquids and sludges in the ponds were removed between 1993 and 1995, after which the ponds were rinsed. Some of the sludges remain in tanks on site, and are being processed and packaged for off-site disposal.

Other actions have already been taken in and around the Solar Evaporation Ponds. Portions of the OPWLs and New Process Waste Lines (NPWLs) have been removed. Soils contaminated by known releases from the NPWLs and OPWLs have been removed if they contained contaminants at greater than RFCA action levels. Various structures near the ponds, and associated with pond operations, have been removed, including Building 788/788A, the 207 Clarifier Unit, and the 308A Pumphouse. Concrete pads associated with RCRA Units 21 and 48 were removed. Contaminated soil associated with Potential Area of Concern 900-1310 has been removed. Manholes, utilities, piping and support racks, concrete ramps and barriers, and unneeded monitoring wells have been removed. All surface soil contamination levels in the vicinity of the Solar Ponds (within IHSS 101) are below the RFCA soil action levels. Similarly, all subsurface soils have contaminant levels less than RFCA action levels, although contamination below these action levels from uranium, tritium, nitrates, gross beta radiation sources, and cyanide has been found beneath the ponds. Pond liner materials contain concentrations of cadmium, lead and arsenic in some cases, although these are also below regulatory limits.

The remaining contamination levels in the vicinity of the ponds indicate that no additional actions are needed for closure under RCRA. As a best management practice, free-standing water in the ponds has been removed, and the berms of the ponds have been pushed in to create a level area. Pond liners, the remaining OPWL, drainage tiles and the ponds' leak detection lines will remain. Approximately 12,000 cubic yards of fill dirt and topsoil were brought in to level the area, and the site is being revegetated using a mix of native species.

Potential contaminant sources in the form of portions of an OPWL will still remain in the vicinity of the ponds. Therefore, excavation at the site in the near term will continue to be controlled through the Site Soil Disturbance Permit process. Fences and signs may be used help minimize disturbance to newly-revegetated areas.

Considering that portions of an OPWL remain in IHSS after site closure, and that some residual soil contamination may remain, a longer-term institutional control in the form of restricting excavation may be needed. Since the area overlies contaminated groundwater, a prohibition on groundwater pumping may be needed, both to prevent exposure to groundwater contamination, and to ensure that groundwater flow patterns are not disturbed. DOE does not anticipate that the area will require physical controls or future maintenance. Monitoring of groundwater will continue as needed, as part of the long-term activities connected with the Solar Ponds Groundwater treatment system. Records that are planned to be retained will include decision documents, as-built drawings of remaining structures, drawings of the final site configuration, closeout reports, and environmental data. DOE may retain administrative jurisdiction over the land in the vicinity of the Solar Evaporation Ponds, to help ensure the success of institutional controls, and as required by the Refuge Act.

#### Water Management Structures

There are a number of surface water impoundments and controls in place at Rocky Flats, whose general purpose is to control and divert flows and help to limit the movement of contamination. The Site actively manages impoundments in the Woman Creek and Walnut Creek drainages. “Active management” consists of monitoring pond levels, measuring water quality, and releasing water through valves or other diversions. Other ponds, including the Lindsay Ranch Pond and Ponds D-1 and D-2 in the Smart Ditch drainage, occur in the Buffer Zone. These are not part of the Site’s water management system, and are not actively managed by Rocky Flats personnel.

The pond system was constructed to allow the Site to prevent the discharge of contaminated water in the event of an accident in the Industrial Area, by storing water in the ponds. Through most of the production years, the ponds were maintained at low levels to maximize their available capacity. Water was diverted into certain ponds (particularly the upper A- and B-series ponds) in the event of industrial upsets; certain of the ponds contain sediment contamination that may warrant remediation.

Between the mid-1950s and 1962, the pond network at the RFETS consisted of Pond A (now known as Pond A-1), Ponds B-2, B-3, B-4, and Pond C (now known as Pond C-1). Pond B-1 was added in 1962. These ponds were operated in series with the flow from one pond entering the next pond downstream until the final pond was reached and the water was discharged off plant site. In June 1973, construction was completed on the three drainages to provide 1) additional detention capacity, and 2) the capability of bypassing flows around particular ponds. A portion of the additional detention capacity created at that time was related to the construction of new ponds, while the remainder of the increased capacity was provided by raising the level of the existing dams.

By mid 1974, Ponds A-1, A-2, A-3, B-1, B-2, B-3, B-4, and C-1 were in operation. The ponds were operated in series until December 21, 1973, at which time Ponds A-2 and B-2 were connected by pipeline, allowing for water transfer between the two ponds, and isolated from the rest of the flow system to allow for management of untreated decontamination laundry wastewater. Construction of the current terminal ponds, A-4, B-5, and C-2, began in 1979 and was completed in 1980 along with surface water interceptor canals to improve surface water management. After the construction of Pond C-2 and the South Interceptor Ditch, Pond C-2 became the C-Series pond available for spill control.

Currently, the terminal ponds (namely, A-4, B-5, and C-2) are operated in a “batch and release” mode. That is, water samples are collected from the ponds while they are filling, and analyses are performed for a number of potential contaminants, including plutonium. The Site makes every effort to not release water before the results of these analyses, but often the ponds fill, and dam safety concerns dictate that they be released. The batch and release mode of operation does provide some assurance that the waters being discharged are of acceptable quality. However, operating in this way also means that the ponds are often quite full, reducing their capacity to capture additional water in the case of an

industrial accident. The terminal ponds are the largest ponds in each drainage. Pond A-4 has a capacity of 33 million gallons, Pond B-5 has a capacity of 24 million gallons, and Pond C-2 has a capacity of 22 million gallons.

The South Interceptor Ditch (SID) was constructed to intercept potentially contaminated surface water run-off from entering the Woman Creek drainage from the south side of the industrial area. It extends from the western edge of the industrial area and the original landfill to just east of Pond C-2. The SID contains a numerous rip-rapped drop structures, which concentrate flow energy (energy dissipation) in plunge pools. Many of the plunge pools have lost their rip-rap, exposing sediments to re-suspension. The SID may be affected by two planned actions. The Original Landfill project may consume the westernmost portion of the SID. An extension of the SID to the east may be considered as part of the 903 Lip Area IM/IRA.

The majority of the ponds are not anticipated to require remediation. Ponds B-1, B-2, and B-3 are the only ponds whose sediments are likely to require removal.

A final determination regarding water management structures that will remain after site closure has not yet been made, and the vested interests in water across the Site remain irresolute. One alternative under consideration would be to retain the current terminal ponds and the SID, and operate these structures similar to their current operating mode. The purpose of these structures would be to detain water. In so doing, they provide an opportunity for particulate matter to settle out, along with any radionuclides that could be associated with these particles. Smaller, upstream ponds could either be removed, or reconfigured to allow for little or no ongoing management. The performance of this type of water management system would be evaluated as part of the five-year review process, and decisions would be made in that context whether active management of the ponds would need to continue, or whether alterations could be made that would reduce ongoing management needs.

Long-term stewardship activities that would be needed if the terminal ponds are kept in their current operating modes are as follows:

- Institutional controls may be needed to prevent excavation or other alterations of water management structures. Physical controls such as fencing and locks may be needed to preclude access to valves and other control devices. DOE may retain water management structures such as the terminal ponds, and will consult with the USFWS on future Site water management alternatives.
- Regular inspection and maintenance will be needed if the terminal ponds remain. The Federal Energy Regulatory Commission currently inspects the dams annually, and a similar inspection regime will likely continue post-closure. The dams and the SID require regular maintenance for vegetation control, replacement of rip-rap, ensuring that outlet structures remain operational, etc. Since such maintenance often occurs in riparian habitats, consultation with the USFWS is often required prior to starting maintenance activities. Maintenance of water quality monitoring stations, which use automated sampling equipment, will also be required as needed.



- Regular operation of the dams will be required if they remain in their current mode of operation. The terminal pond dams are operated in accordance with the RFETS Pond Operations Plan, which includes operating criteria to ensure dam safety. In order to maintain dam safety, pond levels and dam face piezometer levels are continually monitored, and water is released at predetermined levels. Continued operation of the terminal pond dams in the current mode will require an ongoing presence to ensure dam safety.
- Water quality monitoring will continue at the terminal ponds as needed. The outfalls of the three terminal ponds are expected to remain as POCs under a post-closure compliance agreement. Water quality monitoring is discussed in further detail in Chapter 4.
- Information that will likely need to be retained will include designs and as-built drawings, operating records, inspection reports, and water quality monitoring data.

Projected costs for these activities are found in Chapter 7. DOE expects that surface water quality management will be one of the most costly long-term stewardship activities at Rocky Flats.

## Chapter Four

### *Environmental Monitoring and Periodic Review*

#### Introduction

Environmental monitoring will likely be a key component of the Rocky Flats long-term stewardship program. This monitoring should provide the information needed to track conditions at the Site, to determine whether the selected remedies remain effective over time, to provide information to decide whether remedies should be altered, and to guide decisions on when to stop individual stewardship activities. RFPO expects that long-term environmental monitoring will be a highly prescribed activity, as it is now, and may be arrived at through a process similar to that used in preparing the Site's Integrated Monitoring Plan (IMP). RFPO also expects that in the future, as now, the Site's monitoring program will be flexible in order to respond to changing Site conditions, and that changes in the monitoring regime will be agreed upon through consultation with regulators and the community. Finally, RFPO anticipates that certain portions of its monitoring program, especially those relating to demonstrating the performance of the remedy, may become requirements that will be contained as appropriate in all final CAD/RODs, and in any modified RFCA consistent with RFCA Paragraph 286.

This chapter summarizes current monitoring activities at Rocky Flats by major environmental media (surface water, groundwater, air, and ecological resources), and discusses which of these monitoring activities will likely continue following Site closure. The specific numbers of monitoring points, their locations, and parameters to be measured will be highly dependent upon the nature of residual contamination at the Site, and the engineered controls that remain after closure. With few exceptions, such as the

surface monitoring points that are expected to be in place at the terminal ponds and Indiana Street, specific numbers and locations of monitoring points during long-term stewardship are not provided.

### Surface Water

RFETS currently performs several types of monitoring, with the ultimate goal of assuring water quality, especially for water leaving the Site. The major types of surface water monitoring now being performed are:

- 1) *Monitoring dam operations* - - RFETS closely and continually monitors conditions at the terminal pond dams to ensure their integrity. Monitoring of this type includes measuring stream flow into and out of the ponds, measuring water levels in the ponds, measuring piezometer levels in the dam faces, performing regular inspections, monitoring dam crest movements, and annually exercising the ponds' outlet works. These activities are performed for Ponds A-3, A-4, B-5 and C-2.
- 2) *Monitoring Industrial Area water quality* - - RFETS monitors incidental waters (water which collects in footing drains, pits and berms), and performs project-specific monitoring, such as for Decontamination and Decommissioning (D&D) projects, to ensure that they do not have adverse effects on water quality. RFETS also performs monitoring of water entering the sewage collection system and the wastewater treatment plant (WWTP). Finally, water leaving the WWTP is monitored to assess WWTP performance, to ensure compliance with the Site's National Pollutant Discharge Elimination (NPDES) permit, and as a POE pursuant to RFCA Attachment 5.
- 3) *Monitoring inflows to the ponds* - - RFETS operates a surface water monitoring points in the major drainages in the Industrial Area to identify potential sources of actinides, and to correlate actinide levels with water quality parameters such as turbidity and conductivity, as well as flow and meteorological conditions. Included in these are three more RFCA POEs, including monitoring stations SW093, SW027, and GS10. Finally, surface water samples are collected at four locations as part of the storm water provisions of the Site's NPDES permit.
- 4) *Monitoring water quality leaving the Site* - - Prior to discharge of the terminal ponds (A-4, B-5 and C-2), RFETS collects samples from the ponds to ensure that unexpected contaminants have not been introduced. These samples are analyzed by RFETS and CDPHE for a wide range of parameters including metals, organic constituents and radionuclides. The goal of this sampling is to detect possible exceedances and take corrective action in advance of planned discharges, although Site conditions (namely, precipitation) do not always allow for this. RFETS monitors water leaving the terminal ponds at five RFCA POCs, three located at the terminal pond outfalls, and two located where Walnut and Woman Creeks cross Indiana Street. Monitoring is conducted primarily for radionuclides, although heavy metals are analyzed in some samples. CDPHE collects independent water quality samples at Walnut Creek and Woman Creek at Indiana Street.

- 5) *Off-Site water quality monitoring* - - Regular off-site water quality monitoring occurs only at Great Western Reservoir, now used as an irrigation water supply. Additional off-site monitoring could occur in the unlikely event of a release of contaminants from the Site via surface water. Additionally, RFPO supports integrated watershed-wide monitoring through cooperation with the Big Dry Creek Watershed Association, to which RFPO provides both monetary and in-kind support.

RFPO expects that some of the surface water monitoring described above will not be performed as part of long-term stewardship. Sampling associated with the Industrial Area will likely no longer be needed at closure, the sanitary sewer system is planned to have been abandoned in place and plugged, and the WWTP is planned to have been removed. RFPO anticipates that there may not be a need for its NPDES permit after it expires in 2005, so sampling associated with the permit will likely be discontinued. The types of surface water monitoring that are likely to continue into long-term stewardship include the following:

- 1) *Monitoring dam operations* - - As stated in Chapter 3, RFPO anticipates that the Site's three terminal ponds could remain in place after closure, at least for some period of time. Presuming this takes place, monitoring of dam operations would likely take place in more or less the same manner as it does now. RFPO anticipates reviewing the need for the terminal ponds, at least in their present configuration, during the first post-closure five-year review, with an eye towards reconfiguration to an appropriate flow-through configuration. Removal or reconfiguration of the dams would lessen the need for monitoring or eliminate it altogether.
- 2) *Monitoring of remedy performance* - - Remedy performance monitoring could be used for two purposes. The first could be to evaluate the effectiveness of engineered controls in protecting surface water from residual subsurface or groundwater contamination. Consistent with this, Performance Monitoring Points (PMP's, which RFPO believes could supplant POE's in a CAD/ROD or post-RFCA agreement) could be established to confirm the effectiveness of groundwater barriers and engineered covers. Additionally, PMP's could be established to monitor the migration of radionuclides, especially Pu, from areas with residual actinide soil contamination, such as the 903 Lip Area.
- 3) *Monitoring of water quality leaving the Site* - - If the terminal ponds remain in place following closure, RFPO expects that monitoring of water leaving the Site will continue at the RFCA POC's in much the same manner as it does now. While the averaging period for determining compliance at the terminal pond POC's can be extended to one year due to the recent modifications to RFCA Attachment 5, the monitoring regime is expected to remain unchanged. If and when the terminal ponds are removed or reconstructed, the monitoring regime will need to be modified accordingly. This could include moving or removing POC's, eliminating predischarge monitoring, or other actions. RFPO envisions that surface water monitoring at the POC's at Indiana Street will continue for the foreseeable future.

Prior to Site closure, RFPO will consult with local communities to help determine whether or not support for routine off-Site water quality monitoring will continue.

### Groundwater

RFETS currently operates an extensive groundwater monitoring system, which provides information on the nature and extent of groundwater contamination, as well as information on groundwater flow. Per the IMP, the primary objectives of the present groundwater monitoring system are:

- identification of contaminated groundwater and new contamination sources;
- identification and control of contaminant sources;
- identification of contaminant pathways;
- monitoring and trending contaminant concentrations;
- monitoring the effects of remediation and D&D actions;
- monitoring groundwater flow for use in water balance and groundwater modeling; and,
- evaluation of the potential effects of groundwater on surface water quality.

To accomplish these objectives, the groundwater monitoring system at Rocky Flats has the following components:

- 1) *Plume definition wells* - - These are wells located in the main portions of known contaminant plumes, that monitor contaminant levels primarily to provide trending information on contaminant levels. There are 16 wells of this type.
- 2) *Plume extent wells* - - These are wells that are placed near the boundaries of contaminant plumes, and provide information regarding movement of contaminants that could affect surface water. There are currently 42 plume extent wells.
- 3) *Boundary wells* - - These wells monitor the quality of groundwater leaving the Site. There are six boundary wells.
- 4) *Drainage wells* - - These wells are located in the alluvium of stream drainages, downstream of known groundwater plumes. They are designed to detect contamination that may have entered stream drainages, and therefore could affect surface water. There are five wells of this type.
- 5) *Performance monitoring wells* - - These wells serve two purposes. Some monitor groundwater contamination levels following removal actions, to determine the effects of the removal on groundwater quality. Others are associated with engineered controls such as groundwater barriers and passive treatment systems, and monitor their ongoing performance. There are 30 wells in this category.
- 6) *D&D monitoring wells* - - These wells monitor the specific impacts of D&D projects on groundwater quality. There are currently 76 wells of this kind.
- 7) *Plume degradation wells* - - These wells monitor the contaminant conditions in groundwater plumes for which monitored natural attenuation (MNA) may be selected as a remedial action. They are meant to determine whether

contaminant concentrations are decreasing sufficiently to allow MNA as an alternative. There are 13 wells of this kind.

- 8) *RCRA compliance wells* - - These wells monitor groundwater contamination that may be associated with RCRA interim status units. They are primarily associated with the Present Landfill, and there are eight of this type of well.
- 9) *Water level monitoring points* - - RFETS monitors groundwater levels to determine groundwater flow patterns, including any changes in flow patterns that could result from closure activities. Groundwater level data also provides information for groundwater flow modeling, and to support the Sitewide water balance. Water levels are taken each time a groundwater well is sampled for chemical characteristics. Water level measurements are currently taken from 364 wells across the Site, including the wells described above. Water levels may be taken monthly, quarterly, or semi-annually, although 34 wells are equipped to provide real-time water level measurements.

The numbers of wells in the RFETS groundwater monitoring program, as well as the types of analyses and sampling frequency for individual wells can be expected to fluctuate somewhat through closure in response to evolving project needs and changes in groundwater conditions. These changes are formalized through the IMP process, and through the appropriate decision documents.

The overall number of monitoring wells (and/or, the sampling frequency for individual wells) at Rocky Flats may decrease after the Site closes. The numbers and types of remaining monitoring wells will be determined as part of the final remedy. By category, the types of monitoring wells that may remain during long-term stewardship are as follows:

- 1) *Plume definition wells* - - These wells will be evaluated to determine if they still provide useful information, especially regarding forecasting the needed lifetimes of groundwater treatment systems. If not, RFPO may propose elimination of certain of these wells, or a reduction in sampling frequency.
- 2) *Plume extent wells* - - These wells are likely to remain an important part of the groundwater monitoring system after closure, since they provide information on the movement of groundwater plumes relative to surface water. Adjustments to well numbers or sampling frequencies could be made depending on groundwater conditions at closure.
- 3) *Boundary wells* - - These wells would likely remain in place, although RFPO may propose reductions in sampling frequencies, depending on results from upgradient wells.
- 4) *Drainage wells* - - These wells would likely remain in place after closure, to provide verification of the effectiveness of engineered groundwater controls.
- 5) *Performance monitoring wells* - - Those wells that evaluate the effectiveness of engineered controls will likely remain through the lifetime of the individual control. Additional wells of this type may need to be installed to monitor the effectiveness of an additional groundwater treatment system, or for the engineered covers anticipated for the landfills. RFPO may propose that the wells that monitor conditions following removal actions be removed after a finite length of time (say, five years), depending on groundwater conditions.

- 6) *D&D monitoring wells* - -These wells are anticipated to be monitored for five years following the completion of a particular D&D action, at which time they will be evaluated as to whether or not their use will continue. RFPO anticipates that the majority of these wells will be abandoned within five years of Site closure, unless they provide particularly valuable information on groundwater flow or contaminant conditions.
- 7) *Plume degradation wells* - - Certain of these wells will likely remain in place to continue to evaluate conditions in groundwater plumes for which MNA is a selected alternative. The PU&D yard plume and 903 Pad/Ryan's Pit plumes may continue to have monitoring of this type.
- 8) *RCRA compliance wells* - - Wells monitoring the groundwater conditions at the Present Landfill will likely continue in service. Depending on the status of the RCRA permit after closure, these wells may be subsumed within the performance monitoring category.
- 9) *Water level monitoring points* - - Water level monitoring will likely continue at the monitoring wells that remain in service after closure. Additional points, if needed, will be selected based upon their ability to provide groundwater flow information that is relevant to the concerns posed by long-term stewardship. These concerns could include whether groundwater flows after Industrial Area closure have changed, and whether or not changes to the groundwater remediation scheme are needed after closure. RFPO will probably propose discontinuing water level monitoring in the Buffer Zone, except for those wells that are part of the ongoing monitoring network.

RFPO anticipates that evaluation of the Site's groundwater monitoring system will be a major topic of the first periodic review following closure.

## Air

RFETS operates an air monitoring network with scopes and objectives as follows:

- 1) *Ambient air monitoring* - - The Site's Radioactive Ambient Air Monitoring Program (RAAMP) collects ambient radioparticulate air data. There are 39 particulate air samplers in the RAAMP network, which sample continuously. Fourteen of these samplers are located at the Site perimeter; their purpose is to provide data to ascertain compliance with the National Emission Standards for Hazardous Air Pollutants (NESHAPs), specifically for plutonium and other radionuclides. NESHAPs compliance requirements are contained in the RFETS air quality permit, issued by CDPHE. Other RAAMP samplers monitor air quality at specific locations of interest on Site, including one located near the 903 Pad. CDPHE also operates a suite of air samplers at RFETS, including five samplers located near the Site boundary. The CDPHE sampling network provides independent verification of the data obtained through the RAAMP network. In addition, RFPO, in coordination with local communities, supports the four-station Community Radiation Monitoring Program, or ComRad.
- 2) *Effluent air monitoring* - - Exhausts from buildings that contain radioactive materials in sufficient quantity to have the potential to cause a 0.1 millirem

dose to a member of the public are monitored by continuous effluent sampling systems. Currently there are 23 such effluent monitors at Rocky Flats, although at one time there were over 50. These effluent monitors are removed from service as the buildings housing them are decommissioned, in consultation with CDPHE staff.

- 3) *Project performance monitoring* - - Projects that have the potential to release airborne contaminants, including radionuclides and beryllium, may have project specific air monitoring. This can include more frequent analysis of nearby RAAMP samplers, use of portable samplers, or both.
- 4) *Meteorological monitoring* - - RFETS operates a 61-meter tower in the western Buffer Zone that provides data that can be used for emergency response dispersion modeling, CERCLA risk assessment calculations and NESHAPs compliance modeling. Data collected include wind speed and direction, temperature, relative humidity, solar radiation and precipitation. CDPHE operates a series of ten-meter towers that provide data that are used to support emergency response modeling. Finally, the RFETS surface water program operates a series of rain gauges across the Site that provide precipitation data that are used to support contaminant transport investigations and pond operations.

Following closure, no facilities are expected to exist at Rocky Flats that would require effluent monitoring, and there would be no ongoing activities, such as soil disturbance, that would require project performance monitoring, either from on-Site RAAMP samplers or portable air monitors. RFPO believes that the small amount of plutonium and other materials remaining at Rocky Flats after closure, combined with the fact that the industrial facility would no longer exist, could obviate the need for an air quality permit. Presuming that radionuclide air emissions from RFETS continue to be well below standards (as they are currently), RFPO may propose curtailing air monitoring to a subset of perimeter stations. Additionally, RFPO will consult with local communities regarding the ComRad program. RFETS will probably begin scaling back its meteorological monitoring when the need for an ongoing emergency response organization is terminated, and does not anticipate conducting full-scale meteorological monitoring past closure. The single exception to this may be the collection of precipitation data, if this is judged to be useful for operating the terminal ponds following Site closure.

### Ecology

RFETS has conducted extensive ecological monitoring at Rocky Flats since the early 1990's, with the result being that the floral and faunal communities at the Site are very well characterized. Monitoring activities that take place or have taken place at RFETS include:

- Monitoring of animal and plant species presence, location and abundance;
- Monitoring and delineation of major vegetation communities, and wetlands and other aquatic ecosystems;
- Monitoring for the presence, location, and abundance of noxious weeds;

- Determining the presence, location and abundance of threatened, endangered and State special-concern species, particularly the Preble's meadow jumping mouse (*Zapus hudsonius preblei*); and,
- Monitoring of migratory birds.

Ecological monitoring has been conducted to provide a baseline to determine the potential effects of Site projects on ecological resources, and to ensure continued compliance with laws such as the Endangered Species Act. Results of ecological monitoring are also used to formulate the Site's Vegetation Management Plan, which is focused in large part on control of noxious weeds and promoting the vigor of native plant communities.

Following Site closure, RFPO anticipates that the ecological monitoring performed by DOE will be related to the remedies that have been put in place. As an example, the vegetation on soil covers may need periodic monitoring to make certain that the amount and type of vegetation is sufficient for the covers to perform as designed. If remedies affect wetlands and/or habitat for the Preble's meadow jumping mouse, and if mitigation for these effects is required, ecological monitoring could be needed to ensure that such mitigation efforts are successful. Monitoring for other animals and birds could be employed to determine if habitat restoration was successful, and some biological monitoring may be required for the CERCLA periodic review.

Per the requirements of the Refuge Act, most of the Site will be transferred to the USFWS following the completion of cleanup and closure, for management as a National Wildlife Refuge. Ecological monitoring activities on lands that are transferred will likely be conducted by USFWS as part of refuge management. For non-remedy related ecological monitoring on lands retained by DOE, DOE anticipates consulting with USFWS prior to transfer, to determine the types of monitoring that may be needed, and the roles and responsibilities of the two agencies in conducting such monitoring.

### Periodic Review

Periodic review of the remedy at Rocky Flats will be important both to ensure the continuing effectiveness of the remedy, and to maintain public confidence in the remedy. The regulatory requirement for periodic review of the remedy is found in CERCLA, which requires that, if upon the completion of the remedial action, hazardous substances remain above levels that allow for unrestricted use and unlimited exposure. It is DOE's responsibility to conduct the periodic review and to document the review's findings. EPA's role under CERCLA is to review the DOE findings and then issue a finding of concurrence or non-concurrence. In addition, RFPO anticipates seeking input from CDPHE for Rocky Flats periodic reviews, and will employ a process that allows for appropriate public involvement as well.

In general, the CERCLA periodic review is used to:

- 1) Evaluate whether the remedy is operational and functional;



- 2) Evaluate whether the assumptions made in determining the protectiveness of the selected remedy (such as land use, site conditions and applicable standards) are still valid;
- 3) Determine what corrective measures are required to address identified deficiencies, if any; and,
- 4) Evaluate whether there are opportunities to optimize the long-term performance of the remedy, or to reduce life-cycle costs.

In addition to these objectives, DOE has established, in its periodic review guidance, three additional programmatic objectives for periodic reviews:

- 1) Optimize the effectiveness and implementation of remedy requirements;
- 2) Reduce repetitive documentation and paperwork by building upon existing documentation; and,
- 3) Integrating the five-year reviews with other long-term stewardship requirements, including making them a component of long-term stewardship plans.

Consistent with CERCLA requirements and DOE and EPA guidance, RFPO completed the initial five-year review at Rocky Flats, and obtained EPA concurrence on September 26, 2002.

In addition to DOE's programmatic goals noted above, DOE's periodic review guidance states that one of DOE's long-term stewardship goals is to continuously make findings available to the public as remedy performance data are gathered and evaluated. This suggests that DOE maintain regular interactions with both its regulators and the public during long-term stewardship. This currently takes place in numerous ways, such as:

- Regular meetings of citizen oversight groups such as the Rocky Flats Coalition of Local Governments and the Rocky Flats Citizens Advisory Board;
- Regular meetings of other groups specifically devoted to individual issues, such as the Stewardship Working Group;
- The annual State of the Flats meeting;
- Regular reports such as the Site's Annual Report, as well as annual reporting on topics such as air quality, groundwater, ecological monitoring, etc.; and,
- Data exchange meetings.

RFPO will consult with the community regarding which of these mechanisms would be desirable and could be supported following closure, or if new ways of disseminating information would be more appropriate during the long-term stewardship of Rocky Flats. In addition, the community has expressed an interest in conducting periodic reviews of the Rocky Flats remedy more frequently than the mandatory five-year review period. A three-year review cycle has been proposed by the Rocky Flats Coalition of Local Governments, at least for the first few years following closure. The RFCA Parties will consider more frequent reviews and the frequency of CERCLA reviews will be contained in all final CAD/RODs.

## Chapter Five

### ***Records and Information Management***

#### Introduction

The continuing availability of Rocky Flats records and the information that they contain is crucial to achieving long-term stewardship's primary purposes: ensuring the protection of human health and the environment, sustaining natural and cultural resources, and enhancing the use of the Department's land and facilities for the public good. This section of the *Strategy* provides a general outline of records management, a brief overview of Rocky Flats records status, and a prospective plan for the management of the LTS File.

For the purpose of long-term stewardship planning, records management at Rocky Flats can be grouped into three distinct levels of management requirements and responsibilities. The first part of this chapter examines those records that may include a subset of all records created during the lifetime of Rocky Flats up until the point of closure. The second part examines the long-term stewardship file, which includes a subset of all site records necessary to support long-term stewardship activities at Rocky Flats. The last part of this chapter discusses records created in support of long-term stewardship activities after closure.

#### Overall Records Management at Rocky Flats Pre-Closure

*General Overview of the Records Management Process and Rocky Flats Records Collection* - - The Rocky Flats Closure Project is currently on schedule to close by December 2006. Prior to closure, RFPO anticipates that all associated historical and project closure record files will require processing and disposition according to approved disposition schedules. Once records have been processed, they will likely be transferred to an off-site storage facility in accordance with prescribed retention periods. Currently, Rocky Flats records have been and continue to be processed and stored offsite at either the Denver Federal Records Center or the Department of Veterans Affairs Records Center & Vault (VA) in Neosho, Missouri.

The Rocky Flats records collection covers a broad range of information. An internal database of indexed information regarding the contents and locations of these records has been created in order to provide easier and faster access to individual records. This database includes the following information: the box number as well as the file within the box where a record is located, information regarding a record's disposition schedule including its retention period, and key words contained within the record. In the future, this internal database may be consolidated with other DOE site's databases, allowing for a more efficient and centralized record tracking process for records from closure sites. This consolidated database may include the information that is currently indexed by Rocky Flats. Using one consolidated database to locate records from all closure sites could benefit both DOE and the public, enabling faster responses to information requests.

The National Archives and Records Administration (NARA), an independent federal agency whose mission is to preserve our nation's history by overseeing the management of all federal records, approves DOE's recommended records schedules. Every record has a retention period. A retention period identifies the length of time that a record is maintained and managed prior to destruction. These retention schedules are recommended by DOE and submitted to NARA for their approval.<sup>1</sup> When a record's retention period expires it is, upon approval from the owner and taking into consideration any moratorium on destruction, destroyed. Permanent records are maintained indefinitely because NARA appraises them as having sufficient historical or other value to warrant continued preservation by the Federal government beyond the time they are needed for administrative, legal, or fiscal purposes. Such records may be kept because they document an agency's origins, organization, functions, and significant transactions and activities. Records scheduled as permanent may be exempted from destruction. Examples of permanent records in the Rocky Flats collection include: environmental records indicating the presence and amount of contamination of air, water, soil, biological and special materials from onsite and offsite locations; environmental monitoring reports and topical reports defining the extent and levels of contamination in the soil or real estate; and radioactive waste disposal or unplanned disposition records.

*Legal Requirements for Records Management* - - The basic regulation governing records management for the federal government is 36 Code of Federal Regulations Chapter 12, Subpart B – Records Management. Additionally, laws and regulations that apply to radioactive and hazardous waste and materials require certain data to be documented and maintained to demonstrate compliance with statutory provisions. These laws include CERCLA, RCRA, and the Atomic Energy Act. Other laws and regulations address the protection of historic properties and cultural resources. In addition, DOE Orders and guidelines also contain requirements for generating, preserving, and providing access to information.

*CERCLA Administrative Record* - - Section 113 of CERCLA requires DOE to create and maintain an Administrative Record (AR) for each response action at Rocky Flats. The AR is the official body of documents, which forms the basis for the selection of a particular response action. The AR contains documentation of the remedial investigation work plans, remedial investigation reports/feasibility studies, proposed plans, records of decision, engineering evaluation/cost analyses, action memoranda, DOE correspondence, and summaries of sampling data used in the decision-making process. Two terms that are commonly interchanged actually differ in meaning: the AR and the AR File. The AR File is the body of documents that record the decision process as it evolves. It is an active file to which documentation is added as the response action progresses. The AR File becomes the AR only after the final decision document for a proposed cleanup action has been finalized.

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<sup>1</sup> 44 U.S.C. § 2905 designated the Archivist (NARA) as entity that shall establish standards and approve all retention schedules.

The AR File/AR serves two primary purposes. First, the administrative record contains those documents that form the basis for selection of a response action, and any judicial review of any issue concerning the adequacy of any response action is limited to the documentation contained in the record. Second, the record acts as documentation of public participation in selecting a response action.

CERCLA requires the lead agency to make the AR File/AR available for public inspection at or near the CERCLA site. As the lead agency, DOE is responsible for this. The AR is available at the Rocky Flats Reading Room, located at the Front Range Community College Hill Library in Westminster. The AR File Index identifies documents available for viewing in the Reading Room on microfiche cards.

EPA and CDPHE also maintain copies of the AR. When Rocky Flats closes, the EPA and CDPHE likely maintain their copies for at least one year, and then they will likely be stored at a Federal Records Center for at least 30 years. The AR as a whole has a retention period of 30 years; however, the individual records that fall within the AR File may have longer retention periods.

*Access to Records to Meet Programmatic and Legal Requirements* - - RFPO anticipates that significant records management activities will be performed long after the Site is closed. These activities range from managing ongoing and future litigation; contract, budget and financial closeout; post-closure employee benefits administration; responding to Freedom of Information Act, Privacy Act, and other stakeholder information requests; and supporting Energy Employees Occupational Illness Compensation Program Act claims.

*Current and Future Custodians for Rocky Flats Records* - - Currently, RFPO is the custodian of all records generated from Rocky Flats, including those that may be required for long-term stewardship. However, as the Rocky Flats closure date rapidly approaches, DOE Headquarters may appoint a successor organization(s) to be the records custodian. For example, the DOE's Carlsbad Field Office may be the custodian for all transuranic waste records. The long-term steward may manage the active records that fall within the long-term stewardship file. The bulk of the remaining records may be managed by an EM office or another designated organization within DOE. This organization may be responsible for performing many of the activities identified in Section 1.3, above.

These records custodians will be the entities responsible for the management and maintenance of the records. It is important to distinguish between the custodian of records and the entity that maintains physical control. The custodian has the managerial control over the maintenance of the records and any future decisions regarding the records, whereas the entity that has physical control of the records houses and stores them, such as Federal Records Centers.

#### Long-Term Stewardship Records Considerations

*Long-Term Stewardship Records Custodian* - - The goal of the records custodian will be to ensure as needed the continued availability of information required for long-term

stewardship. If an entity with no local presence is designated as a records custodian, a local presence may remain following site closure to facilitate local information requests, although no decision has yet been made in this regard. This could help facilitate a smooth transition from closure to long-term stewardship

*Information/Data Useful to Long-Term Stewardship* - - Following are those types of information that are likely to be of value during long-term stewardship. Many of these kinds of information can already be found in the AR.

#### A. Hazards and Controls

- Information regarding existing hazards. This information includes the location, type, condition, and vulnerability (e.g., to fire, rain, earthquakes) of radioactive and chemical hazards left onsite after cleanup is complete. This information could also include an assessment the likelihood that these hazards will migrate or otherwise move either within the site or to offsite areas. At the point of site closure/ transfer, this information essentially provides a baseline of the state of each onsite hazard at the start of long-term stewardship. Maps and geo-referred information may be important in helping to access the locations of existing hazards.
- Past and present releases and accidents. This information includes reports and other related data on past and present releases and accidents; radioactive and chemical contaminants or materials released during these events; who or what was known or suspected to be exposed to these contaminants; and any documented or suspected exposure levels.
- Disposition of historical hazards. This information pertains to site hazards that existed in the past but were removed or otherwise mitigated to a point that allows unrestricted uses. It also includes legal or supporting documentation to demonstrate that the hazards are no longer present onsite or the extent to which historical hazards were mitigated prior to closure.
- Documentation of engineered controls. This information includes the location, type, condition, and design of groundwater barriers, covers and other engineered controls. This information includes knowledge of which specific barriers/protective mechanisms are required for each existing hazard. This information also includes schedules for maintenance or other related actions required to ensure adequate protections remain in place, as well as all contingency planning information, and any necessary institutional controls associated with the engineered control.

#### B. Operations and Activities

- Process history. This information includes current and historical data on what activities occurred onsite, where these activities occurred, when these activities were conducted, and what infrastructure was used to support these activities, as they are

relevant to long-term stewardship concerns. It includes the processes that occurred on Site, the material used for these processes, and the products and waste produced.

- Historical infrastructure. This information also includes what buildings, facilities, pipelines (including structures such as the Original Process Waste Lines), and other infrastructure existed onsite; where they were located; and what they were used for. It also includes the use of onsite land. Utility and road diagrams and prints would be helpful to visually illustrate historical infrastructure locations.
- Post-closure/transfer operations and infrastructure. Information pertaining to the operation of the site after closure including policies and procedures, post-closure monitoring data, compliance reports, land use during stewardship, remaining buildings/facilities, processes, pipeline, infrastructure, and effluent monitoring. This would include data and records created during the negotiations with USFWS regarding the Rocky Flats Wildlife Refuge.

### C. Regulatory/Legal Framework

- Regulatory framework (past and present). This information includes any compliance agreements, regulations, site closure agreements, permits, or other legal requirements associated with environmental management activities at Rocky Flats.
- Requirements specific to transfer/closure and post transfer/closure. This information includes specific monitoring, maintenance, or reporting requirements established as a part of site closure agreements. This information also includes specific reporting schedules established for monitoring.
- Real estate records. This would include real property records related to acquisition of the site, easements and other access rights onsite and offsite through public/private property, mineral rights, and water rights. This information could also include the delineation of the lands for which DOE retains administrative jurisdiction following closure.

### D. Site Characteristics/Settings

- Information about cultural and natural resources. This information includes the location, type, and condition of onsite natural resources (including minerals, land and water resources, and habitats/species of concern). Responsibility for maintaining some of this information could transfer to USFWS following the transition of the majority of the Site to a National Wildlife Refuge.
- Geophysical and geographic information. This information includes site topography, site hydrology, and site geology.

*Public Accessibility to Stewardship Information* - - Accessibility of information is a major issue associated with stewardship data. The RFPO strongly believes that local

access to pertinent information is critical to ongoing regulator and stakeholder confidence in the remedy. Immediately after closure, there are anticipated to be at least three information repositories: the EPA, the State, and the Rocky Flats reading room or equivalent facility. Each repository will have a copy of the AR and the documents that fall within the AR File. This will give the public immediate access to important data regarding the operational history of Rocky Flats as well as the environmental cleanup that occurred after site closure, although repositories at the State and EPA may not be maintained over the long-term.

The Rocky Flats reading room, located at the Front Range Community College Hill Library in Westminster contains a great deal of the information that is likely to be requested by the public. For example, the reading room houses a copy of the AR File, Closure Plans, Monthly Environmental Monitoring Reports, Rocky Flats Annual Reports, pertinent DOE orders and policies, environmental restoration management data, and newspaper clippings. All materials in the reading room will continue to be maintained and updated throughout remediation until Site closure. Following closure, RFPO is examining the potential for the reading room or equivalent facility to continue to stay open, and provide a primary source of access for Rocky Flats information.

Currently, the reading room librarian is in the process of creating a detailed internal index system of all materials. Once the index has been completed, it may become accessible via the Front Range Community College web site. This would enable the public to search for materials over the web and simply go to the reading room to retrieve copies of the wanted documents (although it has yet to be determined who would pay for copying fees). Information not in the reading room will likely be available through the designated records custodian.

### Records Created During Stewardship

*Future Activities Requiring Data Collection* - - Once long-term stewardship begins, new records and data will likely be generated from these activities. The long-term stewardship custodian will likely be the entity that will manage these active records, requesting retention schedules to accommodate stewardship needs. Furthermore, these records will likely become a subset of the long-term stewardship file and be made available to the public. Access to new records and data, probably in electronic format, will be important for ongoing independent assessment of the success of the remedy by the regulators and by the community. RFPO will work with the stakeholders to determine how new data should be distributed and interpreted.

## Chapter Six

### *Uncertainty Management, Contingency Planning, and Emergency Response*

#### Introduction

This chapter considers the sources of uncertainty that could lead to substantial changes in the long-term stewardship activities that are contemplated in this document. This chapter also discusses the contingency planning that could be put into place to deal with these uncertainties, and where such contingency planning could reside. Finally, this chapter discusses those situations in which emergency response might be needed at Rocky Flats, and the protocols and agreements that might need to be established to ensure that emergencies would be dealt with safely and effectively.

### Uncertainty Management

An initial step in managing uncertainty during long-term stewardship is to identify the major assumptions underlying the plans set forth in this *Strategy*. These underlying assumptions can be set out in a Site conceptual model. The Site does not yet have an agreed upon conceptual model that is contained in a single document. In 2003, RFETS anticipates developing a conceptual model document, as a part of the Comprehensive Risk Assessment methodology. The Site does, however, have a very good understanding of the physical, chemical, biological, historical and social factors that bear upon the sources, pathways, and receptors for contamination at Rocky Flats. As an example, RFETS has, for the past several years, funded the Actinide Migration Evaluation (AME). The AME consists of a panel of nationally-recognized, independent scientists, who have performed basic research into the environmental behavior and fate of actinides at Rocky Flats. Their work will inform the Site conceptual model, as will other technical investigations that have been performed at Rocky Flats over the years.

Some of the major assumptions that will likely be incorporated into the Site conceptual model, and which underlie many of the activities described in the *Strategy* are as follows:

- 1) Plutonium and americium are insoluble in the surface environment at Rocky Flats. The primary method of transport is through erosion, and control of erosion will limit the spread of this type of residual contamination.
- 2) Similarly, plutonium and americium are insoluble in the subsurface environment, and therefore not easily transported by groundwater. Subsurface contamination by these constituents is not expected to be widespread, based upon current groundwater data. This assumption will be tested as part of the subsurface characterization of the Industrial Area.
- 3) Neither plutonium nor americium is actively taken up by plants or animals at Rocky Flats. Bioconcentration of these materials in animal and plant tissue does not take place to any significant degree, nor do these constituents become magnified in organisms through the food chain.
- 4) The shallow aquifer in unconsolidated material beneath the Industrial Area at Rocky Flats is isolated from the deeper, regional aquifer, and there is no environmental pathway between the two. All contaminated groundwater in the shallow aquifer surfaces before leaving the Site.
- 5) Air does not serve as a significant means of off-Site exposure for any contaminant found at Rocky Flats.
- 6) Following Site closure, water will no longer be imported for domestic or industrial purposes, and impervious surfaces will be removed. As a result, surface water flows and the magnitude of response in Site drainages to



- precipitation events will be markedly reduced, in turn lowering the potential for waterborne actinide transport.
- 7) Through studies such as the Rocky Flats Historical Release Report and extensive environmental sampling, all significant sources of contamination have been identified, or will be fully characterized as part of the closure of the Industrial Area. There are no significant unknown contamination sources in the Buffer Zone; additional sampling will take place to further confirm this.
  - 8) Continued Federal ownership for most of Rocky Flats is required pursuant to the Rocky Flats National Wildlife Refuge Act of 2001. This statutory provision will remain in effect for the foreseeable future.

These Sitewide assumptions have already been incorporated into RFCA as appropriate. As an example, groundwater at Rocky Flats is remediated primarily to protect surface water.

For the purposes of forecasting potential uncertainties, it is assumed that there will be a series of engineered controls in place during long-term stewardship, as described in Chapter Three. It is further assumed that there will be two landfills that remain after closure, and that the controls for these landfills may include soil covers. One of these, the Present Landfill, is located to the northwest of the current Industrial Area, and the other, the Original Landfill, is located immediately south of the Industrial Area. Assuming that groundwater contamination is left behind that could affect surface water, groundwater remedies will also remain in place, in the form of up to four passive groundwater collection and treatment systems, three of which are already in place. Another assumption is that there will likely be a series of detention ponds in the RFETS drainages, which would be operated to ensure that water quality leaving the Site will continue to meet RFCA standards, including for radionuclides. In addition, environmental monitoring networks are assumed to be operated on Site, including those for surface water, groundwater and, possibly, ambient air. The engineered controls and monitoring systems left during long-term stewardship are assumed to require appropriate institutional and physical controls to ensure their continued protection, and periodic maintenance to ensure their continued performance.

Given these assumptions, RFPO foresees several potential sources of uncertainty that could reasonably affect long-term stewardship activities at Rocky Flats:

- 1) *Regulatory changes* - - RFPO assumes that the major environmental statutes governing stewardship activities at Rocky Flats (such as CERCLA and RCRA/CHWA) will remain in effect for the foreseeable future. However, changes in numeric standards for soil, air and water, and subsequent changes in individual requirements such as monitoring and reporting, may occur. These changes could result in re-analysis of the effectiveness of engineered controls, changes in the monitoring regime, changes in the nature and extent of institutional controls, new recordkeeping requirements, etc.
- 2) *Physical changes* - - Several types of physical changes could occur that would affect stewardship activities. One of these would be unforeseen changes in groundwater flow patterns that could require re-evaluation of the engineered

groundwater systems or monitored natural attenuation of groundwater plumes. Another could be large floods, landslides or other catastrophic events that compromised engineered structures like dams or groundwater barriers. Finally, physical changes in the engineered structures themselves could occur that would compromise their effectiveness. These could include degradation of panels in groundwater barriers, erosion of soil covers, etc.

- 3) *Compromised institutional or physical controls* - - Vandalism could occur that would damage monitoring systems or engineered controls. Disturbance of residual contamination could occur, most likely through the actions of Site personnel unaware of restrictions on excavation or other such activities.
- 4) *Discovery of additional contamination* - - As mentioned earlier, RFPO does not believe that there will be significant, undiscovered areas of contamination at Rocky Flats at closure, although there is some chance that small, isolated areas of contamination could be discovered in the future.
- 5) *New technologies* - - New remedial technologies may come along that would substantially increase the cost-effectiveness of the remedy. New information management technologies could make the technologies employed to retain Rocky Flats information obsolete or, at worst, unusable.

#### Contingency Planning Considerations

Various strategies could be used to deal with some of these uncertainties. A few of the options for managing these uncertainties could include:

- 1) *Inclusion of contingency in budgets* - - Yearly long-term stewardship budgets for Rocky Flats could contain some funding to allow for contingency (see Chapter Seven for an estimate of stewardship contingency rates). This approach would allow the Site some flexibility in performing additional monitoring, doing additional regulatory reporting, repairing monitoring systems and engineered structures, or dealing with small areas of newly-found contamination.
- 2) *Long-term budget planning* - - DOE offices already perform long-term budget planning, and this would likely continue for DOE sites in long-term stewardship. This type of planning would be helpful in identifying larger expenditures that can be reasonably well forecast, such as major maintenance for engineered controls, or for upgrades in information management technology.
- 3) *Environmental monitoring* - - One potential objective for environmental monitoring during long-term stewardship would likely be detection of physical changes that may necessitate altered or additional remedial actions. A well-designed system should provide sufficient early warning of problematic environmental trends so that corrective actions could be properly planned and budgeted for.
- 4) *Predetermined performance levels* - - For engineered controls, predetermined performance levels could be set to help determine when these controls would need repair or upgrades. These performance levels could correspond to effluent contaminant levels, treatment efficiency rates, contaminant

- concentrations at predetermined evaluation points, trending of environmental data, etc.
- 5) *Maintenance* - - Maintenance activities and schedules for engineered controls and monitoring equipment should be formulated prior to closure, and these expenses should be part of the Site's budget planning process.
  - 6) *Inspection* - - During long-term stewardship, property whose jurisdiction is retained by DOE should be inspected regularly by knowledgeable personnel. Targets of these inspections could include success of institutional controls, and performance and condition of physical controls, engineered controls and monitoring and information management systems.
  - 7) *Clear identification of regulatory requirements* - - Regulatory documents during long-term stewardship (such as the CAD/ROD, post-RFCA regulatory agreement and/or CHWA permit) should clearly specify those activities that are required, to aid future managers in prioritizing and budgeting long-term stewardship activities. Additionally, these documents could in some cases specify the processes to be followed if, say, a numeric standard were to be exceeded, similar to the manner in which water quality exceedences at POE's are handled under RFCA today.
  - 8) *Coordination between land managers* - - During long-term stewardship, RFPO envisions that there will be a close, ongoing working relationship between the two land managers at Rocky Flats, DOE and USFWS. This could in part take the form of review and approval of USFWS activities on DOE-retained land by DOE. These working relationships will begin to be formalized in the Memorandum of Understanding between DOE and the U.S. Department of the Interior, which will be finalized in 2003. RFPO believes that this relationship could be beneficial in terms of ensuring Site security, enabling the success of institutional controls, and integrating Site management techniques.

### Emergency Response

Following the cleanup and closure of Rocky Flats, RFPO believes that there will be very few situations that would occur that would pose an immediate hazard, especially to persons located off-Site. Even a situation like a catastrophic failure of an engineered cover would likely not result in a release of contamination that would warrant an emergency response to protect public health. There are, however, two potential situations that could occur at Rocky Flats that could pose a hazard to off-Site persons or property, and that would warrant emergency actions.

The first such situation is a wildfire at Rocky Flats. Based upon exposure modeling done to support the prescribed burn performed at Rocky Flats in the spring of 2000, RFPO does not believe that a wildfire in areas of residual soil contamination would pose a risk of radiation exposure to firefighters or the nearby public. However, uncontrolled fire would pose a potential threat to nearby property and the public. RFPO believes, therefore, that aid agreements with local fire departments, such as Coal Creek and Westminster, may need to be established for wildfire control during long-term

stewardship. These agreements could be entered into jointly by DOE and USFWS with the local fire departments.

The other situation at Rocky Flats that may warrant emergency actions is the potential for a catastrophic failure of a terminal pond dam. This potential hazard will exist at Rocky Flats for as long as the terminal pond dams remain in their current configuration, and for as long as they are operated in a manner akin to the current batch and release mode. Again, RFPO does not believe that spread of environmental contamination from such an event would cause an emergency situation. However, dam failure could pose a dangerous situation to travelers on Indiana Street east of the Site, and could damage water control structures downstream. To mitigate this hazard, dams will likely need regular inspection, along with appropriate monitoring of water levels and dam conditions by local personnel. Emergency contacts could be established, as they are now, with local governments, especially the Cities of Westminster and Broomfield. Personnel from DOE and local governments will likely need to be available on a 24-7 basis to respond to dam safety situations.

A list of emergency contacts will likely be needed to quickly and effectively deal with emergencies that might arise at Rocky Flats during long-term stewardship. Some of the potential contacts include:

*Management agencies, regulators and law enforcement* - - DOE (either a local Rocky Flats office or other designated office), CDPHE, EPA, USFWS, State Police, Jeffco Sheriff, etc.

*Local governments* - - Jefferson and Boulder Counties, Broomfield, Westminster, Arvada, Louisville, Superior, and Golden

*Other interested parties* - - This could include, in particular, persons living near or businesses located near Rocky Flats.

Emergency response protocols and contacts should be established prior to entering into long-term stewardship, and reviewed and maintained for as long as they are needed.

## Chapter Seven

### ***Funding and Human Resources Needs***

#### Introduction

This chapter explores the possible funding requirements for long-term stewardship activities. Certain of these activities (examples are environmental monitoring and database management) are extensions of current Site activities. In such cases, current costs are known and can be extrapolated with some confidence into the near-term post-closure future. Other activities (such as maintenance of landfill covers) do not currently occur at Rocky Flats, and cost estimates will not have the benefit of on-Site experience. Finally, some of the estimates in this chapter, such as the costs for a DOE office in the area, are quite speculative, since there has been no affirmative decision yet as to whether there would be such an office, how large it might be, and what its specific functions might be.

Estimates contained in this chapter have been derived from several sources. These include the Stewardship Cost Estimate Notebook, prepared by RFPO in 1999, as well as extrapolations of current program costs provided by Kaiser-Hill (K-H) and RFPO subject matter experts. The individual assumptions underlying the cost estimates are discussed in the individual funding categories. All costs are in 2002 dollars.

#### Funding Estimates by Category

*Institutional controls* - - Institutional controls will likely require some sort of periodic monitoring or inspection to ensure that they remain effective. At Rocky Flats, this could be done by local DOE staff, or USFWS wildlife refuge personnel, or through the coordinated efforts of both. Since these activities would be subsumed as part of the duties of future DOE and/or USFWS offices, they are not estimated separately here.

*Maintenance of engineered controls* - - Several kinds of engineered controls will likely remain at Rocky Flats after closure, and maintenance of engineered controls is expected to constitute one of the major long-term stewardship costs at Rocky Flats. The first of these will be groundwater barriers and their associated passive treatment cells. RFPO expects that there may be four of these systems in place, and that, if so, they will require occasional raking of the treatment media, maintenance of flow meters (and the solar powered pump on the Solar Ponds Plume treatment system), and piezometer monitoring. At intervals of about ten years, the treatment media will need to be replaced, while the systems remain operational. K-H currently budgets \$50,000 annually for maintaining each of the three existing cells, and anticipates similar costs for the fourth cell. Annual maintenance has been costing less than this budgeted amount, so K-H believes that this amount would also cover changing the treatment medium as needed. RFPO therefore anticipates an annual maintenance cost of \$200,000 for the groundwater treatment systems.

The second type of engineered control that is assumed to will remain will be landfill covers. These may be in place on the Original Landfill and the Present Landfill. Maintenance will likely include items such as vegetation monitoring and reseeded where needed, repair of eroded areas, and monitoring of lysimeters and piezometers. K-H projects that the annual cost for each landfill cover will be \$150,000, for a total of \$300,000 annually; funding requirements will be dependent upon the remedies that are ultimately selected for the landfills.

The third type of engineered control will likely be water management structures such as ponds and ditches, including the terminal ponds and the South Interceptor Ditch. Maintenance of these structures currently includes yearly dam inspection, piezometer monitoring, vegetation control, cleanout of sediments, exercise and repair of outlet works, and repair of dam and spillway structures. The Site currently budgets \$830,000 per year for this maintenance, which includes twelve dams and the SID. RFPO anticipates that several dams, upstream of the terminal ponds, may be abandoned prior to closure, which could lower this annual total.

Finally, the final land configuration at Rocky Flats may need maintenance. This could include repairs of eroded areas and reseeded of vegetation or weed control where needed. K-H believes that this could cost \$50,000 per year.

The total estimated cost for maintaining engineered controls during long-term stewardship is \$1,380,000 per year.

*Environmental monitoring* - - Environmental monitoring is assumed to be another major long-term stewardship cost. RFPO anticipates that environmental monitoring will consist primarily of surface water, groundwater and, possibly, air monitoring. Environmental monitoring costs will be strongly affected by the number of monitoring points that are in place, the sampling frequency, and the number of analytes. These cannot be predicted with certainty at this point, so the estimates given below may change substantially when the Site's post-closure monitoring plan is finalized.

For surface water, RFPO anticipates that the five RFCA Points of Compliance now in operation will remain after closure. The Site currently budgets \$174,000 for this monitoring, which includes continuous flow monitoring and maintenance of the monitoring stations. Additional, similar monitoring points could function as performance monitoring points to evaluate the ongoing effectiveness of the remedy. RFPO projects that five of these stations may be in place following closure (although this has yet to be defined) at an additional cost of \$174,000. There is also likely to be a need for additional sampling outside of the regular sampling, to investigate unusual results or the effects of unusual events on water quality. After adding a contingency for such sampling, annual surface water monitoring costs would be about \$400,000.

For groundwater, the Site currently spends an annual average of \$8,800 for sampling an individual monitoring well, although costs vary from well to well depending on sampling frequency and the number of analytes. The following wells may be in place after closure: plume extent wells (42 of this type), boundary wells (6), drainage wells (5), performance monitoring/RCRA compliance wells (40), and plume degradation wells (13), for a total of 106 wells. Were these all to remain in place, the associated monitoring costs would be \$932,800, based on current annual expenditures.

RFPO does not believe that all of its current, 14-station air monitoring network will be needed after closure, but has not yet discussed with regulators and the community how many stations, if any, will be maintained. The Site currently spends about \$20,000 per year for each ambient air monitoring station. For the purposes of this estimate, five stations are assumed following closure, with an annual expenditure of \$100,000.

The projected total cost of environmental monitoring in long-term stewardship is \$1,432,800 per year.

*Records and information management* - - RFPO anticipates three types of long-term stewardship costs arising from records and information management. These are: operation of environmental databases, storage and retrieval of paper records, and

operation of the Rocky Flats reading room, should this continue following closure. According to K-H, the Site spends approximately \$400,000 per year operating and maintaining its environmental databases. RFPO expects that this will continue, at least early in long-term stewardship, as data are being actively gathered to evaluate the performance of the remedy.

Regarding storage and retrieval of paper records, RFPO estimates that 72,000 cubic feet of records requiring long-term storage (including stewardship and non-stewardship related records) will be generated through Site closure. About 16,000 cubic feet of these records (including classified records) will likely need to be stored at a facility in Neosha, MO, at a storage rate of \$5.40 per cubic foot per year, or \$86,400 per year. The remaining 56,000 cubic feet may be stored at the Denver records center, with an estimated cost of \$0.35 per cubic foot per year, or \$19,600 per year (the Denver records center is currently changing its storage and retrieval cost structure, so this estimate is subject to change). The total yearly estimated cost for paper records storage and retrieval is \$106,000. This could change if management of certain records (such as WIPP records or personnel records) is transferred to other DOE offices.

RFPO believes that maintaining a reading room, such as the one currently at Front Range Community college, could provide an important community information resource during long-term stewardship. Current costs for the reading room are about \$50,000 per year, including salary, benefits, and space rental.

The total projected cost for records and information management during long-term stewardship is \$556,000 per year, assuming that the reading room is maintained.

*Overhead* - - Overhead costs are additional costs added to labor, equipment and materials to cover contractors' costs of doing business. The Stewardship Cost Estimate Notebook considered a number of possible overhead rates, ranging from 20% to 70%. The notebook quoted DOE Grand Junction Office sources as stating that the overhead rate for their stewardship projects has been in the range of 25%, but recommended a rate at Rocky Flats of 50%. Given these recommendations and current experience, RFPO believes that a 40% overhead rate is reasonable for this estimate. Overhead for the aforementioned costs totals \$1,347,520.

*Contingency* - - Contingency covers costs for unknown or unforeseen conditions that may raise long-term stewardship costs. The Stewardship Cost Estimate Notebook recommends a contingency range of 25-50%, with 35% as the selected value. This percentage, applied to the total of costs plus overhead of \$4,716,320, yields a contingency of \$1,650,712. Additionally, RFPO, in its budget planning estimates submitted to DOE Headquarters, included a near-term, post-closure cost of \$2.5 million per year for the first five years, if a major modification to a remedy should be needed. These total to \$4,150,712 for total contingency costs in the first years after closure. This amount of contingency may be reduced substantially as the needs of the remedy become better known.

*Human resources needs* - - For the purposes of the *Strategy*, it is assumed that there may be a need for a local office for DOE oversight of the remedy at Rocky Flats, at least for the first five years or so following Site closure. This office could perform the following long-term stewardship functions:

- oversight of remedy performance, including inspections, review of monitoring data, assessment of the success of institutional controls, etc.;
- regular data reporting and preparation of periodic reviews;
- regulator interaction;
- stakeholder interactions, including providing a point of contact for stakeholder inquiries;
- contract oversight; and,
- review of USFWS activities to ensure they are consistent with the needs of the remedy.

Certain office functions, such as human resources and legal support, could be provided through another DOE office or Headquarters. Other services, such as for retiree benefits administration and long-term medical benefits, would need to be provided, but are not estimated here.

A small DOE office would be sufficient to handle the expected long-term stewardship workload at Rocky Flats. Using current grade levels as a guide, and assuming typical costs for items such as travel, training and equipment, the total cost for a DOE Rocky Flats oversight office could be about \$500,000 per year. This estimate assumes that the office would be housed in an existing local DOE office, and that DOE would not incur additional expenses for office rental, etc.

*Other costs* - - DOE may incur other long-term stewardship costs at Rocky Flats. Such costs could include:

- contracting with USFWS for ecological management of properties retained by DOE, or law enforcement activities on those properties;
- a grant to the State of Colorado for continued, post-closure oversight; and,
- grants to fund ongoing community-based activities, such as continuation of a citizens' oversight group;
- realty costs, including the cost of a realty officer; and,
- litigation costs.

It is very difficult to precisely estimate what these costs would be (if they arise at all), although RFPO envisions that support for the State of Colorado and citizens' oversight would be considerably less than what is now provided yearly through grants to CDPHE, RFCAB and RFCLOG. For the purposes of this estimate, \$300,000 a year is assumed to be sufficient to cover these expenses during long-term stewardship. As part of the budget planning estimates for long-term stewardship submitted to DOE Headquarters, RFPO staff estimated that \$2.3 million dollars per year could be needed to cover realty and litigation costs in the first years following closure, though these estimates are somewhat speculative. The total projected yearly cost for this category is \$2,600,000.

### Summary of Annual Costs



The following table summarizes estimated annual costs for long-term stewardship, in the initial five-to-ten year period following Site closure, in 2002 dollars:

Engineered Controls Maintenance	
Groundwater barriers (4 @ \$50,000/yr)	\$200,000
Landfill caps (2 @ \$150,000/yr)	\$300,000
Water management (12 dams plus SID)	\$830,000
Land configuration maintenance	\$50,000
Total for engineered controls	<i>\$1,380,000</i>
Environmental Monitoring	
Surface water (10 POC/PMP's + contingency)	\$400,000
Groundwater (106 wells @ \$8,800/well)	\$932,800
Air (5 continuous air monitors @ \$20,000 each)	\$100,000
Total for environmental monitoring	<i>\$1,432,800</i>
Records and Information Management	
Environmental database management	\$400,000
Paper records storage and retrieval	\$106,000
Reading room operation	\$50,000
Total for information and records management	<i>\$556,000</i>
Overhead @ 40%	<i>\$1,347,520</i>
Contingency @ 35%	<i>\$4,150,712</i>
DOE Office Costs (staff plus incidentals)	<i>\$500,000</i>
Miscellaneous Expenses (realty, litigation, grants, etc.)	<i>\$2,600,000</i>
<b><i>Grand Total</i></b>	<b><i>\$11,967,032</i></b>

#### Costs of Eliminating Long-Term Stewardship Activities

Conceivably, remediation at Rocky Flats could be continued to the point where long term stewardship might no longer be needed, and where most of the aforementioned costs could be avoided. The condition of the Site that might need to be achieved to avoid the need for long term stewardship could include the following:

- removal of all waste from the Original and Present Landfills;
- continuation of soil removal from the 903 Lip Area to a level of less than 10 pCi/g of Pu;
- removal of Ash Pits and all disposal trenches;

- removal of surface and subsurface contamination (including contaminated waste lines) from all Industrial Area IHSS's; and,
- removal and/or aggressive treatment of contaminated groundwater, to obviate the continued need for passive treatment systems.

An end state such as this would likely eliminate the need for institutional, physical and engineered controls; would not require ongoing remedy maintenance; and would not require environmental monitoring. Some records would still need to be maintained, and there would continue to be some ongoing cost associated with this.

The costs associated with achieving this end state have not been analyzed in any detail. RFPO, based upon consultations with Kaiser-Hill staff, believes that the costs for accomplishing the first three items listed above (landfills, 903 Lip Area and Ash Pits/trenches) would range from \$700 million to one billion dollars. Please note that these are very preliminary estimates; considerable additional analysis would be required to refine these estimates in the context of remedy selection. The costs for completely cleaning up the Industrial Area, including groundwater, are even more prospective. Complete cleanup (which could involve massive excavation and removal of materials) may not be a technically feasible remedial alternative. RFPO believes that the cost of such an alternative could be at least an additional one billion dollars, and may be much higher than that.

In addition to the monetary costs, complete cleanup poses other problems. Among these would be the need to refill and reclaim much more land than is currently contemplated. This in turn could compromise the use of the surrounding land as a National Wildlife Refuge. Other concerns would include a substantial extension of the cleanup schedule, additional risks to worker safety, and a large increase in traffic caused by the offsite disposal of waste.

## Chapter Eight

### ***Public Involvement***

#### Introduction

Long-term stewardship has become a primary focus of stakeholder interest at Rocky Flats, as the closure of the Site nears and the prospect of a national wildlife refuge becomes more tangible. RFPO believes that public knowledge of and public support for DOE's long-term stewardship plans at the Site are key elements of the success of the closure project. This chapter describes RFPO's plans regarding public involvement for three phases of the formulation and implementation of the Rocky Flats long-term stewardship program. The first phase is the development of the *Long-term Stewardship Strategy* and other documents, such as decision documents and closeout reports. The second phase is the development of regulatory documents and agreements (such as all final CAD/RODs) that will contain the appropriate post-closure requirements. The third

phase is the public involvement activities that will be in place during long-term stewardship.

Rocky Flats now conducts an extensive public involvement program, as an integral part of the closure project. The Rocky Flats public involvement program is designed to increase stakeholder understanding of the closure project, and to provide meaningful opportunities for the public to participate in the decision-making process. A primary goal of the Rocky Flats public involvement program is to involve stakeholders early in the decision-making process. Rocky Flats reaches out to the community in both formal and informal ways. Some of the methods currently used to inform the public and solicit feedback include:

- Maintenance of the Rocky Flats public reading room;
- Preparation of community advisories and news releases on important topics;
- Conducting tours and visits;
- Supporting briefings, workshops and focus groups (such as the Stewardship Working Group);
- Supporting community oversight groups, such as the Rocky Flats Citizens' Advisory Board (RFCAB) and the Rocky Flats Coalition of Local Governments (RFCLOG);
- Holding formal public meetings (such as the annual State of the Flats meeting) and public hearings as required by regulation; and,
- Providing regulatory and policy documents to the public for both formal and informal review.

These techniques will continue to be employed through Site closure, and some may be continued during long-term stewardship.

#### Development of the Long-Term Stewardship Strategy

RFPO has actively sought the involvement of the public during the preparation of the *Strategy*. RFPO worked with the Stewardship Working Group, which consists of regulators, representatives of local communities, and representatives from RFCAB and RFCLOG, to solicit input on the *Strategy*, as well as its overall long-term stewardship program. Individual sections of the document were sent out to stakeholders for their review as these sections were written, and stakeholder comments were considered in preparing the draft for submittal to DOE Headquarters. At the time of submittal to DOE Headquarters, RFPO was working with regulators and stakeholders on initiatives such as the negotiation of a modified RFCA to address post-closure activities at Rocky Flats. With the advent of these initiatives, which will further determine the long-term stewardship program at Rocky Flats, RFPO decided to forego any further revision of the *Strategy*.

RFPO intends that RFCA decision documents, such as Proposed Action Memoranda (PAM's) and Interim Measure/Interim Remedial Actions (IM/IRA's), as well as project close-out reports, describe the stewardship implications of the proposed actions, and factor those into remedy selection as appropriate. These documents will be provided to stakeholders for their review, both on an informational basis as the documents are

developed, and for formal public review. Further, RFPO intends to continue its policy of seeking public input on major remedial actions even before decision documents are drafted. RFPO also intends to continue its practice of providing draft closeout reports to the public.

#### Development of Regulatory Documents and Agreements

As part of Site closure, a number of regulatory documents and agreements will need to be developed, as prescribed under RCRA/CHWA and CERCLA. The general purpose of these documents will be to record Site conditions and remaining risks, to confirm the protectiveness of remedial actions that have taken place, to determine the need (if any) for additional actions, and to analyze the need for, and extent of, long-term stewardship activities. The needed regulatory documents may include some or all of the following:

- A RCRA Facility Investigation/CERCLA Remedial Investigation report;
- A RCRA Corrective Measures Study/CERCLA Feasibility Study report;
- A Proposed Plan;
- A RCRA Corrective Action Decision/CERCLA Record of Decision; and/or
- A modification to RFCA, after RFETS has been deleted from the National Priorities List.

Certain of these documents, such as a Proposed Plan, have prescribed public involvement processes that include steps such as a formal public hearing. Each of the documents listed above will have formal public comment periods. Additionally, RFPO intends to follow its current policy of providing preliminary, informational copies of these documents to interested stakeholders in advance of formal public comment periods to encourage early public involvement. Finally, RFPO intends to work with its stakeholders to determine whether or not additional public involvement activities, such as special workshops or focus groups, would be desirable for these documents. These activities will be performed consistent with the *Rocky Flats Sitewide Public Involvement Plan*.

#### Public Involvement During Long-Term Stewardship

Public involvement activities at Rocky Flats will likely drop precipitously following closure. There are few regulatory requirements for public involvement following completion of the cleanup. The CERCLA five-year review process has a required public involvement component, but does not require ongoing public involvement between scheduled reviews.

RFPO does recognize the need for an ongoing public involvement process during long-term stewardship. Ongoing, post-closure public involvement is supported by DOE's policy on five-year reviews. Such a process would inform the public of current environmental conditions at the Site, including remedy performance. It could be used to involve the public if a change in long-term stewardship activities was being considered. Finally, it would be used to notify the public in the case of remedy failure or other change in Site conditions.

Given that the resources that would be devoted to public involvement during long-term stewardship would be greatly diminished from what they are now, a post-closure program would need to meet the ongoing needs of the community with great efficiency. This need for efficiency will likely be magnified if the amount of resources dedicated to Rocky Flats oversight by regulators and local communities also decreases following closure. The following items could be part of a post-closure public involvement program:

- 1) *Regular data updates* - - Environmental monitoring data will probably be collected from Rocky Flats for the foreseeable future, and providing regular data updates to key stakeholders will likely be a critical public involvement activity. These data updates could take the form of quarterly meetings, similar to data exchange meetings now being held, or through the issuance of quarterly reports. Perhaps the most efficient means of providing regular data updates would be through the issuance of electronic data reports that would be available to the public through a website.
- 2) *Regular information updates* - - In addition to environmental data, DOE could provide narrative information regarding conditions at Rocky Flats. This might include maintenance activities, the status of institutional and physical controls, interpretations of environmental data, forecasted activities, etc. This type of information could be distributed in the form of a simple annual report, which could be distributed to the public at large, reaching a larger audience than the data updates. If USFWS decides to publish regular information on the refuge, such as through a newsletter, informational updates could be distributed in that manner.
- 3) *Local staffing* - - The community has already expressed a strong preference for a local DOE presence to monitor conditions at Rocky Flats following closure. While no decision has been made regarding what level of DOE staff (if any) would remain after Site closure, such staff could be provide a contact for technical questions and information requests. Also undetermined is the level of dedicated staffing that would remain at CDPHE, EPA, local governments and citizens' oversight groups.
- 4) *Emergency contacts* - - The levels of contamination that will likely remain at Rocky Flats after cleanup will be low, and DOE believes that the possibility of an environmental emergency occurring there that would affect residents off-site is very small. Should such a situation arise, however, a system will need to be in place that will allow prompt, direct communication to regulators and local communities.
- 5) *A local information repository* - - RFPO believes that a local information repository such as the current reading room could be an important component of a post-closure public involvement program. Such a reading room could provide public access to current environmental monitoring data and reports, as well as historic information relating to Rocky Flats. This local information repository could be augmented by having information available electronically via the internet.

RFPO does not anticipate that the elements of its post-closure public involvement program will become enforceable regulatory commitments, with the exception of the periodic reviews required by CERCLA. RFPO does believe that this program should be

formalized, perhaps in the form of a post-closure version of the *Sitewide Public Involvement Plan*. RFPO will work closely with the regulators and the community to determine what types of public involvement activities can be supported and what types would be most useful during long-term stewardship.

## Chapter Nine

### ***Natural Resources, Cultural Resources, and Historic Preservation***

#### Introduction

The majority of the Rocky Flats Environmental Technology Site has been free from human disturbance since the land was acquired by the federal government, first in 1951, with later acquisitions from 1974-1976. As result of this isolation, and owing to its location at the boundary between the Great Plains and the foothills of the Rocky Mountains, Rocky Flats has a wide array of habitat types and a rich diversity of plant and animal species. While there are not many significant cultural resources in the Rocky Flats Buffer Zone, those that do exist (such as the Lindsay Ranch) probably also owe their continued survival to the Site's long-term isolation. Finally, the Rocky Flats Plant itself occupies a significant place in local and national history. Since all of the former manufacturing facilities at Rocky Flats are being demolished as part of the closure project, decisions will need to be made regarding how and to what extent the history of the Rocky Flats Plant will be preserved.

This chapter discusses the significant natural and cultural resources present at Rocky Flats, and the potential approach for managing them following Site closure. This chapter also discusses the issue of historic preservation, as well as management of information relating to natural and cultural resources.

#### Natural Resources

*Vegetation* - - About 600 species of vascular plants have been found on Rocky Flats. This is an exceptionally large number of species for a tract of this size, and results from the mixing of Great Plains and Rocky Mountain plant species. The Site contains an array of distinct vegetation communities, including shortgrass prairie, various wetland types, tall upland shrubland, and Great Plains riparian woodlands. Of special note is the presence of the xeric tallgrass prairie. This community has been identified as a rare plant community both in Colorado and in North America as a whole, and its presence at Rocky Flats constitutes a significant environmental resource. Approximately 1,800 acres of tallgrass prairie are found at Rocky Flats; the Colorado Natural Heritage Program (CNHP) has identified the community found at Rocky Flats, together with that found on open space property to the west of Highway 93 as the largest remaining tract of this vegetation type remaining in North America. In addition to the tallgrass prairie and other rare plant communities, several rare individual plant species occur at Rocky Flats. These include the mountain-loving sedge (*Carex oreocharis*), forktip three-awn (*Aristida*

*basiramea*), carrionflower greenbriar (*Smilax herbacea*), and dwarf wild indigo (*Amorpha nana*). These plants are listed as rare or imperiled by the CNHP, although neither these nor any other of the plant species known to occur at Rocky Flats is listed as threatened or endangered pursuant to the federal Endangered Species Act.

Rocky Flats conducts an aggressive vegetation management program, the goals of which are to enhance the vigor of native plant communities and to control noxious weeds, which constitute a very real threat to native species. Foremost among the significant problem species at Rocky Flats is diffuse knapweed (*Centaurea diffusa*), which can now be found virtually everywhere at Rocky Flats. Several types of weed control are used at Rocky Flats. These include aerial and hand spraying using the herbicides Tordon 22k, Transline and Telar; about 1,100 acres at Rocky Flats receive aerial herbicide application annually. Other controls include biological controls (the use of insects to control weeds in areas where use of herbicides is impractical), physical controls such as mowing and road grading and, in certain instances, hand-pulling where weed infestations are small and local. In 1999, Rocky Flats also performed a test prescribed burn on 48 acres of tallgrass prairie, to determine whether this technique would be successful in reducing thatch buildup and encouraging native species. This test was successful in both regards.

The Rocky Flats vegetation management program has had generally good results in slowing the advance of noxious weeds and in maintaining the general health of the Site's various plant communities. However, DOE foresees that there may be a continuing need for vegetation management following closure. Since the majority of the Site is anticipated to be transferred to the U.S. Fish and Wildlife Service for management as a National Wildlife Refuge, the responsibility for vegetation management in these areas will fall to USFWS, which will analyze vegetation management alternatives in its Comprehensive Conservation Plan. Vegetation management will also likely be required for those areas retained by DOE, particularly for those disturbed areas or areas with engineered covers that are revegetated as part of Site closure. DOE believes that it would be most efficient for the USFWS to manage vegetation on the Site as a whole, and plans to discuss allocation of responsibilities and costs for vegetation management with USFWS as part of the overall transition of the Site to a National Wildlife Refuge.

*Wildlife* - - About 250 species of terrestrial vertebrates have been found at Rocky Flats, a very high number for an area of this size. By comparison, 322 terrestrial vertebrates have been found in Rocky Mountain National Park, which encompasses a much larger area. Of the species recorded at Rocky Flats, about 200 are birds, along with 45 mammals (including eleven carnivores), nine reptiles and seven amphibians. The Preble's meadow jumping mouse (*Zapus hudsonius preblei*), a federally-listed threatened species, is resident at the Site. Two other federally-listed species, the endangered peregrine falcon (*Falco peregrinus*) and the threatened bald eagle (*Haliaeetus leucocephalus*) have been observed at the Site, though neither nests there. Other rare species also occur at Rocky Flats. Federal special-concern species that have been observed at the Site include the eastern short-horn lizard (*Phrynosoma douglasii brevirostra*), the loggerhead shrike (*Lanius ludovicianus*), and the western burrowing owl (*Athene cunicularia hypugea*). Colorado Species of Special Concern that have been observed at the Site include the

northern leopard frog (*Rana pipiens*), the long-billed curlew (*Numenius americanus*) and the American white pelican (*Pelecanus erythrorhynchos*). In addition to vertebrate species, uncommon invertebrates can be found at Rocky Flats, including the hops blue butterfly (*Celastrina humulus*) and the Arogos skipper (*Atrytone arogos*).

Wildlife has not been actively managed by DOE at Rocky Flats in the recent past, apart from extensive surveys. The Site is closed to hunting and fishing. Apart from the stocking of fish in Rocky Flats ponds (both by homesteaders and while the Site was under federal ownership) no vertebrate species have been intentionally introduced. In general, wildlife populations are indirectly managed through the management of vegetation and habitat. However, the USFWS, which co-manages the Rock Creek Reserve in the northern portion of the Site, recently extirpated largemouth bass (*Micropterus salmoides*) in the Lindsay Ranch Pond in the Rock Creek drainage, a prelude to the reintroduction of native plains fish species such as the northern red-bellied dace (*Phoxinus eos*). USFWS may continue to perform such wildlife management activities on the Rock Creek Reserve through closure. Following closure, on lands that are transferred to USFWS, wildlife management activities will likely become the responsibility of USFWS, and will be analyzed in the Comprehensive Conservation Plan that is being prepared for the refuge. For those areas not transferred to USFWS, DOE believes that it would be most efficient for USFWS to perform wildlife management for on those areas as well. DOE plans to discuss allocation of responsibilities and costs for wildlife management with USFWS as part of the overall transition of the Site to a National Wildlife Refuge.

### Cultural Resources

Cultural resources are scarce at Rocky Flats. Native American resources are almost non-existent, and are limited to a very few stone alignments and isolated artifacts. The paucity of Native American artifacts is probably representative of both low usage of the area, combined with the difficulty of finding artifacts on Rocky Flats, which is well-vegetated compared with other local areas. Most of the historic sites and artifacts that have been found on Rocky Flats date from the early 1900's and are associated with cattle ranching. The most significant of these is the Lindsay Ranch complex, which is located in the Rock Creek drainage, and consists of the remains of a house, barn, outbuildings, fences, corrals, etc. The ranch was originally settled in 1907, with portions being added on up until its acquisition by the U.S. Government in 1951. None of the cultural resources at Rocky Flats (apart from the Industrial Area itself) has been determined to be eligible for listing on the National Register of Historic Places. However, the Rocky Flats National Wildlife Refuge Act of 2001 stated that the Lindsay Ranch homestead site "shall be permanently preserved and maintained in accordance with the National Historic Preservation Act."

The cultural resources at Rocky Flats are, for the most part, located on lands that are anticipated to be transferred to the USFWS. This includes the Lindsay Ranch. The management of cultural resources on the refuge following closure will be the responsibility of the USFWS, and cultural resource management alternatives will be



analyzed in the Comprehensive Conservation Plan being prepared for the refuge. In the interim, however, DOE intends to work with USFWS, local communities, and state and local historic preservation groups to develop strategies for best managing the Lindsay Ranch prior to transfer of the property to USFWS.

### Historic Preservation

Rocky Flats' significance as a historic site was officially recognized in 1996 when it was placed on the National Register of Historic Places. The Rocky Flats Plant Historic District (as it is referred to in the National Register of Historic Places registration form) encompasses all the major production buildings, as well as administrative, medical, infrastructure, maintenance and waste treatment buildings. Since all Site buildings are being removed as part of the closure project, historians will need to rely on photographs, documents, artifacts and oral histories to reconstruct Site activities after closure.

Recognizing this situation, a group of local citizens, including representatives of local governments, has formed the Rocky Flats Cold War Museum project. The mission of the Museum is to document the historical, environmental and scientific aspects of Rocky Flats and to educate the public through the preservation of artifacts and the development of interpretive and educational programs. The Museum has established a Board of Directors (of which RFPO is an *ex officio* member), and has hired a Director for the prospective museum. The Museum Board is currently undertaking a feasibility study to determine the conditions under which a Rocky Flats Cold War Museum could be most successful.

The Rocky Flats National Wildlife Refuge Act of 2001 allows the Secretary of Energy to establish a Rocky Flats museum, and directs the Secretary to consult with the City of Arvada, other local communities and the Colorado State Historical Society on the development and siting of a museum. By the end of 2004, the Secretary must submit a report to Congress discussing costs associated with the construction of a museum and any other issues relating to the development and construction of the museum. To support the report to Congress, RFPO intends to continue to work with local communities (including the City of Arvada) and the Museum Board to gather information on community preferences, potential costs, and implementation issues. RFPO believes that the feasibility study could provide useful information in this regard.

### Natural and Cultural Resources Information Management

Raw natural resources data, consisting largely of field observations, are maintained as paper files by the Kaiser-Hill ecology group, and have been placed on the Kaiser-Hill sitewide computer database. Annual wildlife and vegetation reports, which have been produced since the early 1990's, are on file at the Site, have been distributed to stakeholders, and have been placed in the Rocky Flats reading room. Cultural resources data are available in summary reports filed on Site and in the reading room; there is no computerized database of cultural resources records.

In general, RFPO does not anticipate the need to retain natural or cultural resources information following closure, for the purpose of maintaining the effectiveness of the remedy. It is unlikely, therefore, that much of this information will be retained in the Site's administrative record file. RFPO anticipates making this information available to the USFWS, who will be responsible for management of these resources on the refuge. Presuming the reading room is maintained following closure, natural and cultural resources information could be maintained there as well. The role of any future museum as a document repository for natural and cultural resources information has yet to be determined.

## **Appendix 1: Long-Term Stewardship Activities Associated with Completed Remedial Actions at Rocky Flats**

## **Appendix 2: Figures**

**Figure 1. Rocky Flats' Location in the Denver Metropolitan Area**

**Figure 2. Site Map of Rocky Flats**

**Figure 3. Map of Open Space Near Rocky Flats**

**Figure 4. Individual Hazardous Substance Sites at Rocky Flats**



**Figure 5. Surface Water Features at Rocky Flats**

**Figure 6. Groundwater Contamination at Rocky Flats**

**Figure 7. Plutonium in Surface Soils at Rocky Flats**

**Figure 8. Americium in Surface Soils at Rocky Flats**

**Figure 9. Original Process Waste Lines**

**Figure 10. Map Showing Possible Future Extent of Institutional Controls  
at Rocky Flats**

## **Appendix 3: Stakeholder Comments Received on this Draft**

## **Appendix 2: Figures**